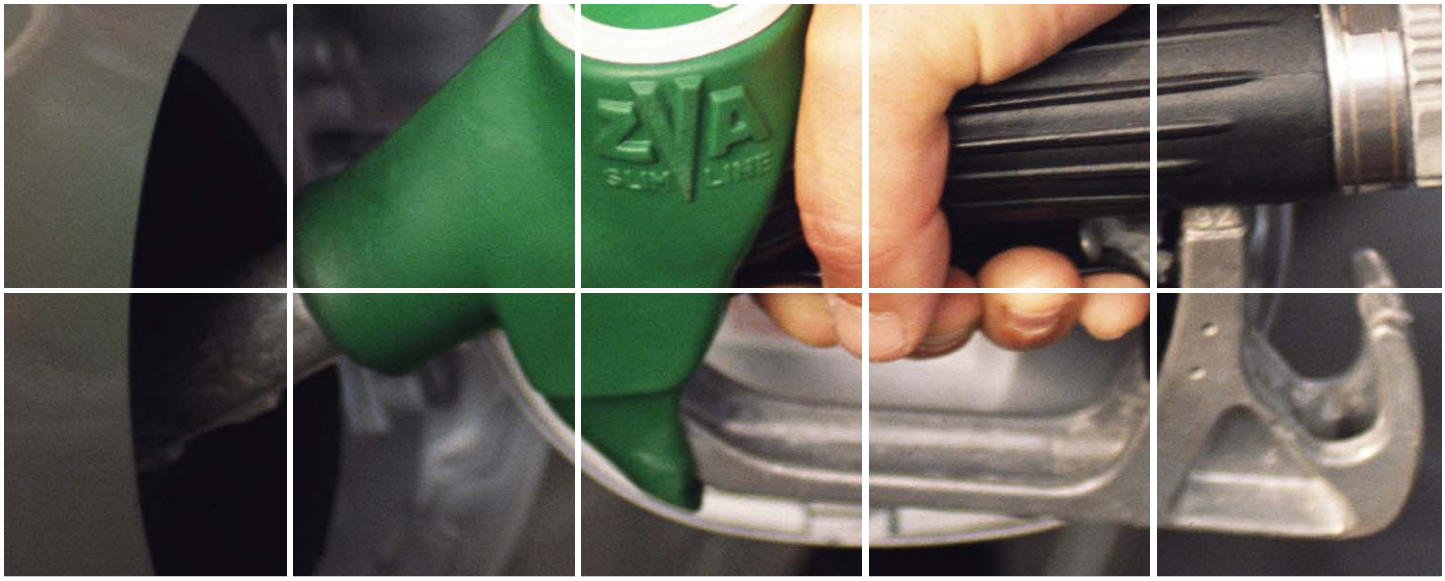
AEA



# EU Fuel Quality Monitoring – 2007 Summary Report

**Report to the European Commission, DG Environment**

By Charlotte Brannigan, Eleanor Glenn, Fiona Twisse, Agnieszka Griffin and Nikolas Hill

Restricted Commercial
ED05471
Draft - Issue Number 1
Date October 2009

| | |
|---|---|
| **Title** | EU Fuel Quality Monitoring - 2007 Summary Report |
| **Customer** | European Commission, Directorate-General Environment |
| **Customer reference** | 070402/2006/456019/MAR/C3 |
| **Confidentiality, copyright and reproduction** | This document has been prepared by AEA Technology plc in connection with a contract to supply goods and/or services and is submitted only on the basis of strict confidentiality. The contents must not be disclosed to third parties other than in accordance with the terms of the contract. |
| **File reference** | ED05471 |
| **Report number** | AEA/ED05471/R2 |
| **Report status** | Draft |

AEA
The Gemini Building, Fermi Avenue
Harwell International Business Centre
Didcot, OX11 0QR
United Kingdom
Telephone +44 (0)870 190 6490
Facsimile +44 (0)870 190 6318



| | Name | Signature | Date |
|---|---|---|---|
| **Author** | Charlotte Brannigan<br>Eleanor Glenn<br>Fiona Twisse<br>Agnieszka Griffin<br>Nikolas Hill | | |
| **Reviewed by** | Nikolas Hill | | |
| **Approved by** | | | |

# Executive Summary

This report produced for DG Environment represents a consolidation of the seventh year of Member States' submissions under Directive 98/70/EC[1], summarising the quality of petrol and diesel in the Community for the year 2007. Specifications for petrol and diesel sold in the European Community are included in the Directive. Two sets of fuel specifications are included, the first entered into force on 1 January 2000 and the second entered into force on 1 January 2005. The Directive also stipulates that Member States are required to report summaries of the quality of fuels sold in their territories. The original reporting format for this was laid out in Commission Decision 2002/159/EC of 18 February 2002[2] (Appendix 1). Additional requirements were defined in the European Standard for fuel quality monitoring systems, EN 14274:2003, required from 2004 under Directive 2003/17/EC.

Agreement was subsequently reached on amendments to the reporting format, with a common format for reporting from 2004 developed in consultation with Member States and other stakeholders in 2004 (Appendix 4). Member States were required under the Directive to report for the first time by 30 June 2002 for the preceding calendar year (i.e. 2001). A summary of the submissions received for 2001 to 2006 were presented in previous reports.

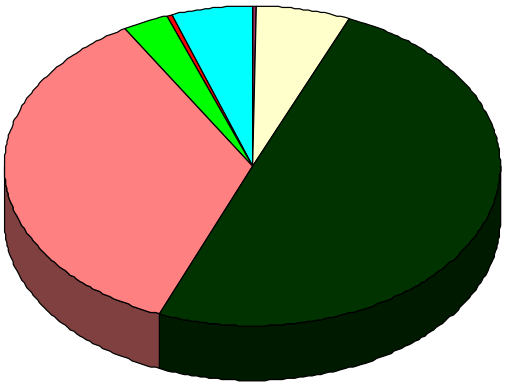
Figure E1 below shows 2007 data (excluding Luxembourg who has not submitted a report) for fuel sales by petrol and diesel grade. The variety of RON and sulphur grade fuels available across the EU had decreased during 2005 with the introduction of a mandatory limit of <50ppm sulphur. The majority of petrol sales in 2007 comprised RON 95 (49.7% compared to 83% petrol sales in 2006). Of all petrol sold, 49.7% was low sulphur (<50 ppm) and 35.2% sulphur free (<10 ppm). Sulphur free diesel sales have increased from 31% of sales in 2006 to 42.1% in 2007. Low sulphur (<50 mg/kg) sales have fallen to 57.9% in 2007 (from 69% in 2006). These figures illustrate the further increases in sales of sulphur-free fuels in the EU. Sales from the new EU12 Member States comprised 12.4% and 12.6% of total petrol and diesel sales in the EU respectively (increasing from 10.1% and 9.9% in 2006). Figure E2 below illustrates the temporal trend in average sulphur content of petrol and diesel fuels in the EU.

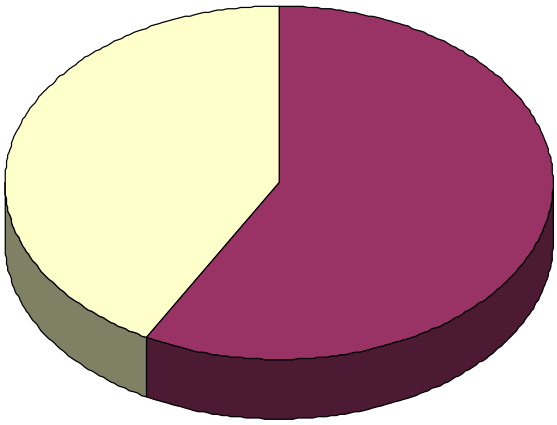
In general the quality of Member State's monitoring system design, level of compliance with limit values (see Figure E3) and information provided in report submissions is still continuing to improve. However as noted in 2006, although sulphur-free fuels are accounting for an increasingly significant proportion of fuel grades and sales across Member States, they are still not always labelled at the pump. There are still also significant problems in timely delivery of reports from some Member States. In fact the situation has worsened for these very late reports compared to last year, with Submissions from Ireland Italy and the Netherlands received four months late. The UK and Malta submitted Fuel Quality monitoring reports for 2007 reporting more than 7 months late. Luxembourg has not submitted a report in 2007.

[1] O.J. L 350 of 28.12.1998, p. 58
[2] O.J. L 53 of 23.2.2002, p.30

**Figure E1: EU Fuel sales proportions by fuel type (%)**

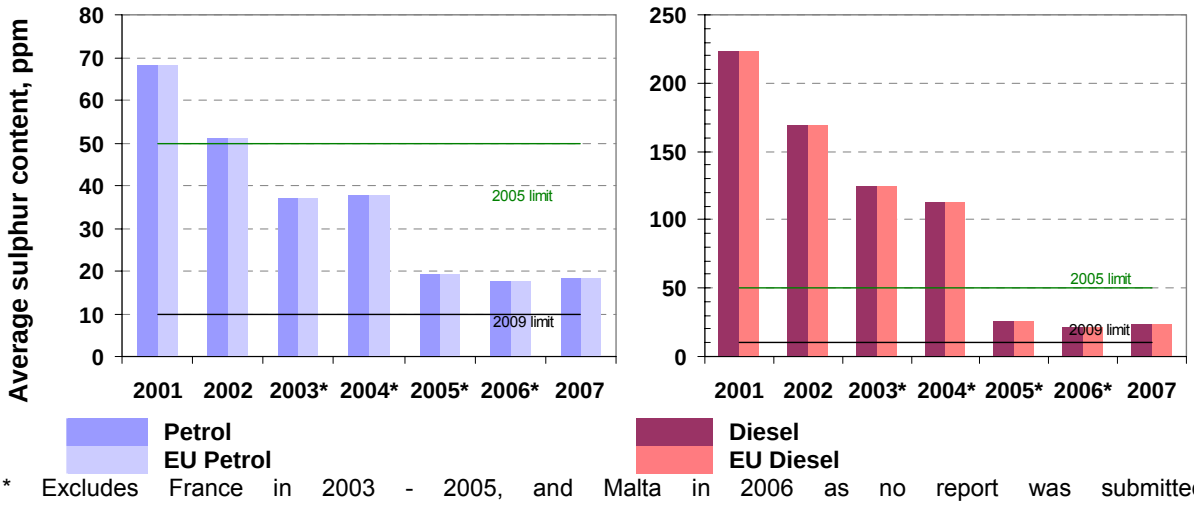
| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





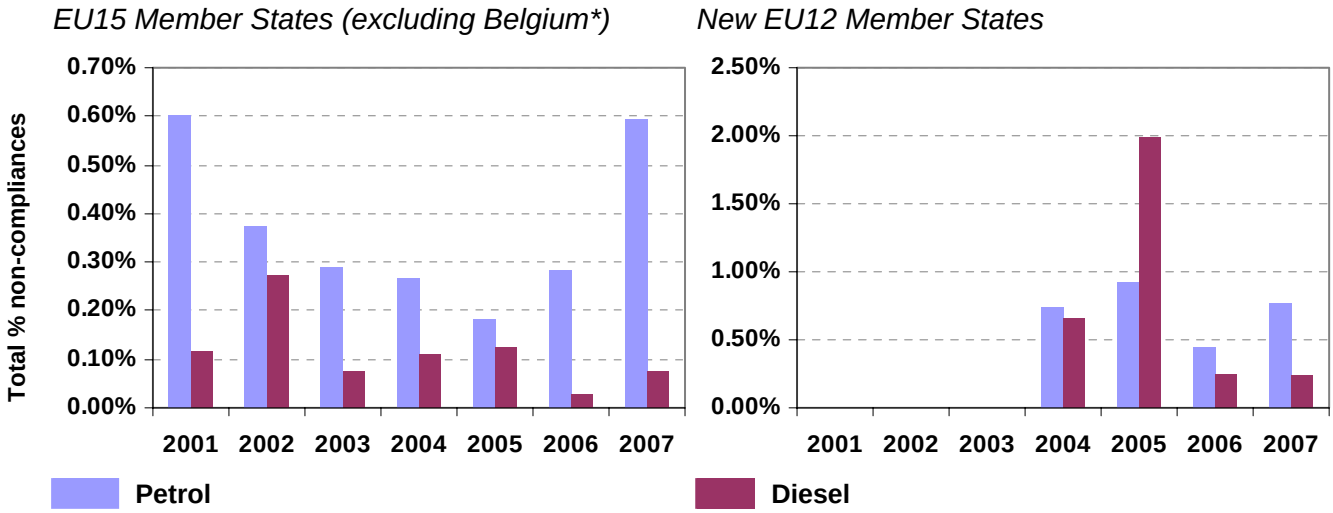
| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | 0.0% | 13 | Diesel | 0.0% |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 0.2% | 14 | Diesel (<50 ppm sulphur) | 57.9% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 6.3% | 15 | Diesel (<10 ppm sulphur) | 42.1% |
| 4 | Unleaded petrol min. RON=95 | 0.0% | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 49.7% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 35.2% | | | |
| 7 | Unleaded petrol 95=<RON<98 | 0.0% | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 3.0% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | 0.07% | | | |
| 10 | Unleaded petrol RON>=98 | 0.0% | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 0.1% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 5.3% | | | |

**Figure E2: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* Excludes France in 2003 - 2005, and Malta in 2006 as no report was submitted.

**Figure E3: Temporal trends in total limit value non-compliances for petrol and diesel fuels**




* Excludes France in 2003 - 2005, as no submissions were provided. Also excludes Belgium, as the very large number of sample analyses (and therefore also non-compliances) hides general trends.

Revisions to the reporting format from Commission Decision 2002/159/EC and European Standard EN 14274: 2003 outlined in the Excel reporting template, have enhanced the usefulness of the information and facilitated analysis of EU trends. The quality of the monitoring systems' design, compliance with limit values and information provided in report submissions is continuing to improve in most cases. However, there are still a few key areas for improvement, summarised as follows:

1) Some Member States (including Malta and the UK) have submitted reports extremely late. They are encouraged to report on time to avoid undermining the efforts of others.
2) Similarly, a small number of Member States have reported Fuel Quality monitoring more than three months after the 30th June deadline for 2007 (including Ireland Italy and the Netherlands).
3) Regarding monitoring system and reporting consistency with EN 14274 requirements:
   a) Several Member States do not fulfil sufficient sampling for all fuel or are not sampling in sufficient numbers at refuelling stations (as opposed to depot/refinery).
   b) Where Member States use their own National Systems rather than one based upon the European Standard, there needs to be a description of this system. This description should also provide an assessment that shows the monitoring system's equivalency in statistical confidence to EN 14274: 2003. This has *still* not been provided in most cases for 2004-2007 monitoring and needs to be provided in future.
   c) Where EN 14274 Statistical Model C is used, Member States should present a clear rationale for its use on the basis of both number of fuel sources/supply points and country size /possibility of division of the territory into regions. For several Member States using Model C (and not providing this information) there appears to be a good case on the basis of NUTS regional classification for instead using Model's A or B.
4) In relation to the availability of sulphur free fuels, it is necessary for these fuels to be clearly labelled to ensure that the consumer has the opportunity to choose them. A number of Member States have not implemented a system whereby sulphur content at fuel pumps are clearly labelled. Reporting on labelling could help the automotive industry gain confidence in their availability so that vehicles taking full advantage of the fuel are more widely introduced.

5) It would also be valuable, for the Member States not already doing so, to report separately (to <50pm fuels) the results of sulphur content analyses that were carried out on fuels sold as sulphur-free to further confirm their quality. These analyses need not be additional to existing sample analyses, but simply a subset of the existing total sampling and analysis requirement as part of their monitoring systems, as provided for in the Excel reporting template.

Following the success of the Excel reporting templates, revised templates for reporting on 2007 monitoring were produced, taking into account additional standard test methods introduced in EN 228:2004 and EN 590:2004 and providing an additional line to allow for separate reporting on sulphur content analyses of samples from fuel sold as sulphur-free. There have been no significant changes to the template for 2008 reporting (presented in Appendix 6). The 2008 template will be sent to Member States as in previous years. The use of the template should further assist Member States in their data reporting and again facilitate accurate data collation and analysis for the 2008 summary report.

# Contents

## Appendices

# Glossary

| | |
|---|---|
| *<10 ppm fuels* | See sulphur free fuels |
| *Cetane Number* | Measure of fuel ignition characteristics. Like the octane number used for petrol, the higher the value, the better the fuel performance. |
| *Commission Decision 2002/159/EC* | Commission Decision of 18 February 2002 on a common format for the submission of summaries of national fuel quality data |
| *Commission Recommendation 2005/27/EC* | of 12 January 2005 on what, for the purposes of Directive 98/70/EC of the European Parliament and of the Council concerning petrol and diesel fuels, constitutes availability of unleaded petrol and diesel fuel with a maximum sulphur content on an appropriately balanced geographical basis |
| *Directive 98/70/EC* | of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC |
| *Directive 2003/17/EC* | of 3 March 2003 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels |
| *EN 14274: 2003* | Automotive fuels - Assessment of petrol and diesel quality - Fuel Quality Monitoring System (FQMS) |
| *Euro standards* | European Union emission regulations for new vehicles, e.g. Euro 3 |
| *Fuel Dispensing Sites* | See *refuelling stations.* |
| *FQMS* | Fuel Quality Monitoring System |
| *MON* | Motor Octane Number (petrol vehicles, related to RON) |
| *National fuel grade* | Member States may, define 'national' fuel grades that must still, however, respect the specification of the *parent fuel grade*. For example, national fuel grades may comprise super unleaded petrol (RON > 98), lead replacement petrol, zero sulphur petrol, <50 ppm sulphur petrol, zero sulphur diesel, <50 ppm sulphur diesel, etc. |
| *Parent fuel grade* | Directive 98/70/EC sets the environmental specifications for petrol and diesel fuel marketed in the EU. The specifications in the Directive can be thought of as 'parent fuel grades'. These include: (i) regular unleaded petrol (RON>91), (ii) unleaded petrol (RON>95) and (iii) diesel fuel. |
| *PAH* | Polycyclic Aromatic Hydrocarbons, also known as PAH, are chemical compounds formed by the incomplete combustion of hydrocarbons and also contained in small amounts in diesel, other fuels. Many of them are known or suspected carcinogens and are consequently restricted in content in diesel. |
| *Refuelling Stations* | Sites, retail or commercial, where fuel is dispensed into road vehicles for propulsion (as defined in EN 14274: 2003) |
| *RON* | Research Octane Number (petrol vehicles, related to MON). The octane number is a performance rating used to classify motor fuels by grading the relative antiknock properties of petrol grades. |
| *Sulphur free fuels* | Petrol and diesel fuels that contain less than 10 mg/kg (ppm) of sulphur (whether actual distinct national fuel grades, or simply marketed products meeting this criterion) |
| *The Sulphur Review* | 'Consultation on the Need to Reduce the Sulphur Content of Petrol and Diesel Fuels Below 50 ppm: - A Policy Maker's Summary'. A report produced for the European Commission, DG Environment; George Marsh, Nikolas Hill and Jessica Sully, November 2000; AEA Technology Environment, UK. See: http://europa.eu.int/comm/environment/sulphur/summary.pdf |
| *Zero sulphur fuels* | See *sulphur free fuels*. |

# 1 Introduction

This report produced for DG Environment represents a consolidation of the seventh year of Member States' submissions under Directive 98/70/EC[3], summarising the quality of petrol and diesel in the Community for the year 2007. The specifications for petrol and diesel sold in the European Community are included in the Directive. Two sets of fuel specifications are included in the Directive, the first entered into force on 1 January 2000 and the second entered into force on 1 January 2005. The Directive also stipulates that Member States are required to report summaries of the quality of fuels sold in their territories. The original reporting format for this was laid out in Commission Decision 2002/159/EC of 18 February 2002[4] (Appendix 1). Additional requirements were defined in the European Standard for fuel quality monitoring systems, EN 14274:2003, required from 2004 under Directive 2003/17/EC.

Agreement was subsequently reached on amendments to the reporting format, with a common format for reporting from 2004 developed in consultation with Member States and other stakeholders in 2004 (Appendix 4). Member States were required under the Directive to report for the first time by 30 June 2002 for the preceding calendar year (i.e. 2001). A summary of the submissions received for 2001 to 2006 were presented in previous reports. The 10 new Member States, who joined the EU in 2004, submitted reports in 2005 for the first time to cover monitoring from May to December 2004. Bulgaria and Romania joined the EU in 2007 and although they were not yet obliged to report on Fuel Quality Monitoring for 2006, both countries submitted reports for that year. Bulgaria and Romania's 2007 reports therefore represent the first year for which, as EU members they have been obliged to submit a report under the auspices of the Directive. Luxembourg did not submit a Fuel Quality Monitoring report for 2007 and therefore this 2007 EU Summary report features data submitted by 26 EU Member States.

## 1.1 Report Structure

This report follows the same basic format developed for the preceding years reporting, agreed with the European Commission and validated at expert meetings with stakeholders, including Member State and EU candidate country representatives, the auto industry and the oil industry.

**Section 1** begins by setting out the background and context for the control of fuel quality and its relation to harmful tailpipe emissions from vehicles.

**Section 2** outlines the format for the summary chapter on each EU Member State, along with an explanation of the fuel quality monitoring and reporting requirements being assessed in each part of the chapter.

**Sections 3 to 29** summarise the information reported by individual EU Member States, as part of their submissions of summaries of national fuel quality data. This includes information on:

- Sales quantities of different fuel grades;
- Availability of low or sulphur-free petrol and diesel grades;
- Summary descriptions of the monitoring systems in place;
- Compliance with sampling, reporting requirements and with Directive 98/70/EC limits;
- Trends in sales and availability of low or sulphur-free grades since 2001.

[3] O.J. L 350 of 28.12.1998, p. 58
[4] O.J. L 53 of 23.2.2002, p.30

**Sections 30 and 31** provide an overall EU summary, discussion of the 2007 reporting and conclusions/recommendations for future reporting.

## 1.2 Context

Concerns over air quality and climate change have grown significantly in the past decade. Reduction of fuel consumption and associated greenhouse gas and other emissions has therefore become a higher priority for governments, the public, vehicle manufacturers and the fuel industry alike. Transport is a significant contributor to carbon dioxide ($CO_2$), as well as other emissions and demand is increasing. By far the largest single portion of transport emissions derives from passenger cars, which account for around half of the total transport $CO_2$ emissions in the European Union. Fuel quality has strong links to both $CO_2$ and air quality related emissions; the following sections briefly outline the main policy drivers relating to fuel consumption, $CO_2$ emissions, air quality and their influence on fuel quality legislation.

### 1.2.1 Fuel Consumption and Carbon Dioxide Emissions

The Community's strategy[5] to reduce $CO_2$ emissions from passenger cars and improve fuel economy is aimed at reducing average $CO_2$ emission value for new passenger cars. The automobile industry has also committed itself through voluntary agreements to improving the fuel economy of vehicles. Additionally, on 7th February 2007, the Commission adopted Communication (COM (2007) 19) outlining a comprehensive new strategy to reduce carbon dioxide emissions from new cars and vans sold in the European Union. Furthermore, on the 17th December 2008, the European Commission adopted a new schedule (Regulation (EC) No 443/2009) to phase in carbon dioxide emission standards.

This strategy, together with a revision of EU fuel quality standards implemented under Directive 2009/30/EC, further underline the Commission's determination to ensure the EU meets its greenhouse gas emission targets under the Kyoto Protocol and beyond. The Commission has also introduced a compulsory requirements aimed at the gradual decarbonisation of road fuels, through the amendment of the fuel quality directive under Directive 2009/30/EC (detailed discussion in section 1.2.3).

The automobile industry has attached a great importance to the availability of low sulphur (<50 ppm) and sulphur-free (<10 ppm) fuel to meet both the mandatory emission limits for nitrogen oxides (and diesel particulates) and the targets for reduced $CO_2$ emissions. Sulphur free fuels enable the use of improved catalytic technology and reduce particle emissions, facilitating compliance with existing (and future) emissions standards and helping to improve fuel efficiency (in particular for the purpose of implementing direct injection). Under the Directive Member States were required to have sulphur free fuel available *'on an appropriately balanced geographical basis'* from 2005, with mandatory full conversion by 2009 in order to support fuel efficiency requirements. As such, the acceptable Sulphur Content for all fuels available within the European Union will be limited to a maximum of 10 mg/kg from 31st December 2009.

### 1.2.2 Air Quality

In September 2005 the European Commission adopted a Thematic Strategy on Air Pollution, defining the ambition level for further improvements in some key environmental problem areas related to air pollution in the European Community up to the year 2020. One of the key

[5] (COM(95) 689 final, supported by the Council in 1996 and the European Parliament in 1997

measures of the Thematic Strategy was a proposal for a new directive on air quality, bringing together a number of separate instruments into a single legal act[6], as well as introducing new limit values and exposure related objectives for $PM_{2.5}$. This new Directive[7] was adopted on 21 May 2008. Member States have two years to transpose the Directive; until then the existing legislation generally applies, with some provisions of the new Directive to be implemented sooner.

Releases of carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides ($NO_x$) and particulate matter (PM) from vehicles are covered under the vehicle emission standards (so-called Euro standards). These are all measured separately for petrol and diesel cars as well as light and heavy goods vehicle classes, and contain maximum permitted emissions over a standard drive cycle. There are currently four stages for cars and Light Commercial Vehicles (LCVs) – conventionally labelled with Arabic numerals - that have progressively tighter emissions limits. Euro 4 has been in force for new types of vehicles since 1 January 2005 and since 1 January 2006 for all new vehicles. A further two new standards, Euro 5 and Euro 6, were introduced in Regulation No 715/2007[8], June 2007. Euro 5 will apply from 1 September 2009 and sets tighter emission limits of particles and $NO_x$ for new cars and vans sold in the EU, for example an 80% reduction in PM emissions and a 20% reduction in $NO_x$ emissions from diesel cars compared with Euro 4 limits. Euro 6, which will enter into force on 1 September 2014, sets significantly lower limits for $NO_x$ emissions from diesel cars (68% lower than the current Euro 4 limits).

The emission classes for Heavy Duty Vehicles (HDVs) are conventionally labelled with Roman numerals. Euro IV entered into force on 9 November 2006 for new types of vehicles, while Euro V will enter into force on 1 October 2008 and sets a 43% reduction in the $NO_x$ emission limit compared with Euro IV. In December 2007 the European Commission released a proposal for a further, Euro VI stage which would apply from 1 April 2013 for new vehicle types and 1 October 2014 for all new registrations[9]. Under Euro VI, the emission limits for HDVs would be reduced by 80% for $NO_x$ and 68% for PM.

The stakeholder consultations for the Euro V and VI emission limits have shown only one parameter to be of importance for them to be met, which is the availability of sulphur-free fuels. As already discussed, mandatory full conversion to sulphur-free petrol and diesel fuels is required under the fuel quality directive by 2009.

### 1.2.3 Fuel Quality

There are currently six key documents that set requirements for the quality of fuel sold in the EU and the monitoring and reporting of fuel quality. These are as follows (a more detailed summary of these requirements is discussed in section 2, Box 1):

- Directive 98/70/EC;
- Commission Decision 2002/159/EC (Appendix 1);

[6] The Framework Directive 96/62/EC, the first Daughter Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, the second Daughter Directive 2000/69/EC relating to limit values for benzene and carbon monoxide in ambient air, the third Daughter Directive 2002/3/EC relating to ozone in ambient air, and the Exchange of Information Decision 97/101/EC.
[7] Directive 2008/50/EC on ambient air quality and cleaner air for Europe.
[8] Regulation No 715/2007 on on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:171:0001:0016:EN:PDF
[9] Proposal for a Regulation of the European Parliament and of the Council on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0851:FIN:EN:PDF

- European Standard EN 14274:2003;
- Directive 2003/17/EC;
- Commission Recommendation 2005/27/EC (Appendix 5).
- Directive 2009/30/EC

The parameters covered in the fuel quality standards outlined in Directive 98/70/EC fall loosely into two categories. The first include physical properties, such as octane number (RON and MON) for petrol; Cetane number and density for diesel. These need to be within certain limits in order for internal combustion engines to function efficiently, and have an impact on emissions of both air quality pollutants and $CO_2$. The second category includes fuel content that may be more directly linked to harmful emissions, such as hydrocarbons, sulphur and lead content. The standards are listed within Commission Decision 2002/159/EC found in Appendix 1 of this report.

A general ban on the marketing of leaded petrol was agreed by EU institutions from 2000. Sulphur is of particular interest as its presence in fuels can harm the effectiveness of several existing and emerging automotive technologies such as three-way catalytic converters, oxidation catalysts, $NO_x$ adsorber catalysts (NACs) and particulate traps. The mandatory limit for sulphur was set at 50 ppm for petrol and diesel from 2005. Debate as to whether the 2005 limit should be reduced further prompted the EC to launch a consultation with stakeholders in 2000[10]. The decision to amend Directive 98/70/EC resulted in a requirement for introduction of sulphur-free fuel (<10 ppm sulphur) to be made available *"on an appropriately balanced geographical basis"* from January 2005[11] (with annual reporting in availability[12]). Full mandatory conversion to sulphur-free petrol is to be achieved by 2009. These requirements are implemented under the amending Directives 2003/17/EC[13].

The reasoning behind this amendment is that by 2009 the composition of vehicle fleets able to take full advantage of the lower sulphur content should be sufficient to offset any disadvantages due to additional refining of the fuel. The availability of sulphur-free petrol (<10 ppm) would lead to an improvement in the fuel economy of future gasoline direct injection cars by 1-5%, compared to similar vehicles using fuel containing a maximum of 50 ppm sulphur. It would also lead to lower emissions of conventional pollutants from the existing fleet of petrol vehicles.

With regard to heavy duty vehicles, exhaust after-treatment devices will perform better and be more durable with sulphur-free diesel. The fuel economy of other diesel vehicle types and technologies would also improve by using sulphur-free fuels (for example, reduced regeneration frequency of particulate filters) and its use by the existing fleet could also lead to lower emissions of pollutants such as particulate matter.

The European Commission has conducted a review of the fuel quality Directive (98/70/EC). The publicly available information on the review is published at http://forum.europa.eu.int/Public/irc/env/fuel_quality/library. Following this review, the Commission made a proposal in early 2007 to modify certain aspects of the Directive, which was subsequently adopted as Directive 2009/30. This is discussed in more detail later in this section.

[10] The results of this consultation may be found on in the following report available on DG Environment's website: 'Consultation on the Need to Reduce the Sulphur Content of Petrol and Diesel Fuels Below 50 ppm: - A Policy Maker's Summary'. A report produced for the European Commission, DG Environment; George Marsh, Nikolas Hill and Jessica Sully, November 2000; AEA Technology Environment, UK.
[11] Directive 98/70/EC also specifies that Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with the Directive by 30 June 2003.
[12] Article 8 of Directive 98/70/EC, as amended by Directive 2003/17/EC
[13] O.J. L76 of 22.3.2003, p. 10

***Reporting on Fuel Quality from 2005***

Amendments to Directive 98/70/EC made in 2003 (Directive 2003/17/EC) require Member States to develop Fuel Quality Monitoring Systems (FQMS) in accordance with European Standard EN 14274:2003, to have been in place from 1 January 2004. A summary of monitoring and reporting requirements under the standard follows:

1. Specification of information requirements in order to set up the FQMS, including regional level data (number of refuelling stations, sales, population and number of vehicles);
2. The system is to be run twice a year, for the summer and the winter periods (as summer and winter fuels have different specifications);
3. Specification of the minimum number of sample sites of fuel grades required (in order to make the FQMS as robust and representative as possible), depending on the statistical model being used (chosen depending on the size of the country and how it is split into regions);
4. Specification of a list of all retail (public vehicle) and commercial (private fleet) fuel dispensing sites is required (by region) and that sampling should take place across randomly selected samples of these;
5. Specification of the minimum number of samples/sites for fuel grades with less than 10% of sales.

Directive 2003/17/EC requires that Member States report on the geographical availability of sulphur free fuels, but neither the Directive nor EN 14272 defines what the appropriate geographical availability should be or how to measure this. These issues were addressed in Commission Recommendation 2005/27/EC, which contains guidance on what constitutes appropriate geographical availability and suggests a range of methods (options) by which Member States can calculate and report on geographical availability. However, the recommendations are not mandatory and many Member States have not supplied this level of detail in their reports.

The progressive adoption of EN 14272 by Member States is leading to greater consistency in the data available for assessment of the various fuel quality parameters. However, there is an option in Directive 2003/17/EC, in which: *"the use of an alternative fuel quality monitoring system may be permitted provided that such a system ensures results of equivalent confidence"*. This means that some Member States use alternative systems, i.e. national systems, thus reducing both the ease of direct comparisons between different Member States and the guarantee of availability of certain data. Some Member States have indicated that they are in transition from a national system to EN14272.

# 2 Member State Summaries: Reporting Format and Requirements

This introductory section outlines the format for the subsequent summary chapter on each EU Member State, together with an explanation of the fuel quality monitoring and reporting requirements being assessed in each part of these chapters.

The information reported by individual Member States, as part of their annual submission of national fuel quality data, includes:

- Sales quantities of different fuel grades;
- Availability of sulphur-free petrol and diesel grades;
- Summary descriptions of the monitoring systems in place;
- Compliance with sampling and reporting requirements and with Directive 98/70/EC limit values in the analysis of samples.

Box 1 summarises the requirements of the five key documents relating to fuel quality monitoring and reporting in the EU. The EU Fuel Quality Monitoring Submissions Reporting Template (Appendix 6) was designed based on the reporting requirements of the Directives and additional supplementary information to assist evaluation. It is divided into mandatory reporting requirements under the Directives (including EN 14274 requirements) and optional reporting fields as per the Commission Decisions. Examples of these supplementary fields include test methods used for each parameter, which is important information to determine compliance with limit values, and the number of samples non-compliant with the limits and their values, which give an indication of the scale of the issue. Completion of these parts of the template reduces the need to seek clarifications or additional information from Member States.

**Box 1: Key documents and requirements relating to fuel quality in 2007**

**Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC**

Specifies for the parent fuel grades, RON>91, RON>95 and diesel:

- Limit values (and tolerance limits according to EN ISO 4259:1995) for each fuel parameter. The limit values are either a minimum (e.g. RON) or maximum (e.g. vapour pressure, DVPE).
- Test methods for monitoring the above.

Two sets of fuel specifications are included in the Directive, the first entered into force on 1 January 2000 and the second entered into force on 1 January 2005 (as amended by Directive 2003/17/EC). The Directive also stipulates that Member States are required to report summaries of the quality of fuels sold in their territories.

**Commission Decision 2002/159/EC on the common format for the submission of summaries of national fuel quality data. (Appendix 1)**

- *Format*: Provides a common report template covering all parameters in Directive 98/70/EC. Reports to be submitted in both paper and electronic formats.
- *Date*: Reports to be submitted by 30 June each year, data for the preceding calendar year.

**European Standard EN14274:2003, Automotive fuels – Assessment of petrol and diesel quality – Fuel quality monitoring system (FQMS)**

- Each Member State must establish a **Fuel Quality Monitoring System (FQMS),** taking into account factors such as the number of refineries supplying the market, the

number of fuel grades available and the sales volumes of different types of fuel.

- Summary of sampling requirements:

| *Sampling parameter* | *Requirement* |
|---|---|
| By whom | Sampling by appointed organisations; analysis by accredited laboratories |
| Where | Refuelling stations |
| When | Separate summer and winter sampling and reporting periods |
| Number of sites | Minimum numbers for each of the summer and winter periods, according to statistical Model A, B or C or a national system. |
| Sample selection | Randomly in each region, to fulfil the minimum number of sample sites. |
| Methods | Specified in Directive 98/70/EC or EN228:2000 (petrol) and EN590:2000 (diesel), or later versions. |

- Builds on and expands the reporting format specified in Commission Decision 2002/159/EC.

**Directive 2003/17/EC amending Directive 98/70/EC relating to the quality of petrol and diesel fuels**

- In each Member State from 1 January 2005, sulphur-free (<10ppm) fuels were required to be made available "on an appropriately balanced geographical basis". From 1 January 2009 only sulphur-free fuels will be permitted, throughout the EU (to be confirmed for diesel).
- Requires Member States to annually report on the availability of sulphur-free fuels.

**Commission Recommendation 2005/27/EC (Appendix 5)**

Guidance on what constitutes availability of fuels "on an appropriately balanced geographical basis". Excepting special cases where there is very high availability or a single terminal/island market, Member States may choose to calculate availability by:

- Option A, proportion of refuelling stations with sulphur-free grade available by region;
- Option B, average distance between refuelling stations with sulphur-free grade available;
- Option C, availability of sulphur-free fuels at large refuelling stations;
- Option D, availability of sulphur-free fuels at highway/motorway refuelling stations; or
- Their own alternative means.

The information reported by each Member State is presented in summary chapters under the headings in the following sections. An overall summary of EU fuel quality monitoring and reporting is presented in a separate section.

## 2.1 FUEL AVAILABILITY

For each Member State a table is presented listing the fuels that were reported to be available nationally, where full sales data were provided and the category under which sample analysis results were reported. It lists the parent fuel grades as specified in Directive 98/70/EC and each corresponding national fuel grade.

Each Member State's fuel availability table will be a subset of the full list of the basic fuel grade categories shown below. Sales in the EU of fuels containing more than 50ppm sulphur content were no longer permitted from 1 January 2005. Therefore fuels under categories 1, 4, 7, 10 and 13 are no longer available. Additionally, as of 1st January 2009,

reporting categories 2, 5, 8, 11 and 14 will be no longer available for analysis in reporting year 2009.

**Table 1: Basic European fuel grade categories**

| Reference no. | Basic fuel grades |
|---|---|
| 1 | Regular unleaded petrol (minimum RON = 91) |
| 2 | Regular unleaded petrol (minimum RON = 91 & < 50 ppm Sulphur) |
| 3 | Regular unleaded petrol (minimum RON = 91 & < 10 ppm Sulphur) |
| 4 | Unleaded petrol (minimum RON = 95) |
| 5 | Unleaded petrol (minimum RON = 95 & < 50 ppm Sulphur) |
| 6 | Unleaded petrol (minimum RON = 95 & < 10 ppm Sulphur) |
| 7 | Unleaded petrol (minimum 95 =< RON < 98) |
| 8 | Unleaded petrol (minimum 95 =< RON < 98 & < 50 ppm Sulphur) |
| 9 | Unleaded petrol (minimum 95 =< RON < 98 & < 10 ppm Sulphur) |
| 10 | Unleaded petrol (minimum RON >= 98) |
| 11 | Unleaded petrol (minimum RON >= 98 & < 50 ppm Sulphur) |
| 12 | Unleaded petrol (minimum RON >= 98 & < 10 ppm Sulphur) |
| 13 | Diesel fuel |
| 14 | Diesel fuel (< 50 ppm sulphur) |
| 15 | Diesel fuel (< 10 ppm sulphur) |

In some cases during 2007 reporting, Member State do not provide separate analyses for <50 and <10ppm sulphur-content variants of a fuel grade, in which case the Reporting Category is designated as the <50ppm fuel grade. In other cases sample analysis results of all petrol RON/sulphur grades are reported under a single category and then the analysis 'reporting category' will be different from the base fuel reference number, for example for the highlighted fuels (3,6 and 15) below:

| Reference Number | Parent fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 2 | RON 91 | <50 ppm | ON EN 228 "Normal" | 2 |
| 3 | RON 91 | <10 ppm | ON EN 228 "Normal" | 2 |
| 5 | RON 95 | <50 ppm | ON EN 228 "Super" | 5 |
| 6 | RON 95 | <10 ppm | ON EN 228 "Super" | 5 |
| 12 | RON 98 | <10 ppm | ON EN 228 "Super Plus" | 12 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel | 14 |

### 2.1.1 Sales

In this section, separate pie charts are presented for petrol and diesel fuels, showing the proportion of each of the 15 fuel grade categories sold in the Member State. The charts are useful for comparing the degree to which different fuel grades have permeated the market in each Member State, as there is much variability across the EU.

Separate sales figures for low or sulphur-free fuel grades were not available in previous years reports for some Member States. However it is known that fuels complying with these criteria were available in many cases, e.g. Belgium, Denmark, Finland, Hungary, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal and Slovakia. In the past there has been significant variation in reporting on sales between different Member States. There can be defined four distinct levels of fuel grade categorisation, each a subset of the former level, under which Member States have previously reported sales quantities (or sample analyses). These levels are as follows:

1) ***Parent fuel grades*** – defined according to Directive 98/70/EC (i.e. minimum RON 91 unleaded or minimum RON 95 unleaded petrol);

2) ***National fuel grades*** – defined at a national level with additional requirements to the Directive parent grades, for example minimum RON 98 unleaded petrol, or sulphur-free fuels;
3) ***Marketed fuel grades*** – fuels may be marketed and sold by fuel suppliers as distinct grades with additional specifications beyond Directive and national requirements, e.g. higher RON levels or sulphur-free fuel grades;
4) ***Sulphur content split of fuel grades*** – in some cases fuels are available meeting lower (e.g. sulphur-free) sulphur specifications to those required by the Directive or Nationally, but not specifically marketed as a separate grade by fuel suppliers.

An indication of the application of this distinction in the reporting is provided in the Member State sections, where information is available.

### 2.1.2 Sulphur content

As outlined in section 1.2.3, according to the Directive, the sulphur content of all petrol and diesel sold in the EU must be less than 50ppm ('low' sulphur) from 1 January 2005. In addition, 'sulphur-free' petrol (<10ppm sulphur) must be made available *"on an appropriately balanced geographical basis[14]"*.

This section provides summary details about the sulphur content and availability of different fuel grades available in the Member State, with information under the following headings:

- **Geographical availability of sulphur-free fuels:** Reporting required by Directive 2003/17/EC. Ideally this should be determined by one of the methods in the Commission guidance note (Recommendation 2005/27/EC[15]), except in special cases where there is very high availability (e.g. 60-80%) or a single terminal/island market.
- **Are sulphur-free grades clearly labelled differently / marketed separately?** : Separate labelling and marketing is not strictly required by the Directives, but it is important for consumers to have the opportunity to choose sulphur-free fuels. This is essentially a prerequisite for the introduction of vehicles using technology requiring the fuels before full mandatory introduction in 2009.
- **Average sulphur content of all petrol and diesel sold**: the mean sulphur content of sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold
- **Additional information.**

The section also includes a table of the average sulphur content for each year 2001 to 2007, for petrol and diesel. A chart in the section on temporal trends (see 2.3) displays the same information graphically (to compare with the proportions of 'official' sulphur grades) with yearly comparisons against the EU averages for petrol and diesel sulphur content.

[14] Article 3(2) & Article 4 (1) of (amended) Directive 98/70/EC
[15] Commission Recommendation 2005/27/EC of 12 January 2005 on what, for the purposes of Directive 98/70/EC of the European Parliament and of the Council concerning petrol and diesel fuels, constitutes availability of unleaded petrol and diesel fuel with a maximum sulphur content on an appropriately balanced geographical basis.

# 2.2 FUEL QUALITY MONITORING

## 2.2.1 Description of system

This section outlines a summary of the key information components of the Fuel Quality Monitoring System (FQMS), under the following headings:

- **Responsible organisation(s):** Responsible for monitoring and reporting on fuel quality in the Member State, but not necessarily the actual sampling which is often carried out by fuel companies.
- **Format of Fuel Quality Monitoring System (FQMS):** EN 14274 statistical model A, B or C, or a national system.
- **Country Size:** Large (greater than 15 million tonnes automotive fuel dispensed per year), or Small.
- **Summer Period:** 1 May to 30 September (normal), or 1 June to 31 August (for Member States experiencing arctic or severe weather conditions). Different grades are available in the summer and winter periods. As far as reporting is concerned the summer period is mainly relevant to vapour pressure limit values, but also separate reporting tables on analyses for summer and winter periods is specified in EN 14274.
- **Location(s) of sampling:** At refuelling stations (as required by EN 14274), and/or refineries or terminals/depots.
- **Time/frequency of sampling:** EN 14274 requires that sampling is undertaken in both the winter and summer periods.
- **Specification of test methods:** As per Directive 98/70/EC.
- **Collection of sales data:** by the responsible organisation, from fuel companies or other sources
- **Other details:** for example about the number of refineries and distribution of fuel in the country, or about progress on implementing EN 14274.

## 2.2.2 Sampling and reporting

For each Member State a summary of reported sampling is provided, along with an assessment of compliance with the various elements of Directive 98/70/EC and EN14274.

Directive 98/70/EC specifies the parameters that are to be monitored for petrol and diesel fuels (18 and 5 parameters respectively). Member States are required under the Directive to use a monitoring system based on European Standard EN 14274, unless given dispensation by the European Commission to use their own National System where it is of equivalent statistical confidence.

EN 14274 specifies separate reporting for Summer and Winter periods, and 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 (in each of the winter and summer periods), see Table 2.2. This is to ensure a high level of statistical confidence (95%) that the results are representative of all the fuel sold in the territory.

**Table 2.2: Sampling requirements for different Fuel Quality Monitoring Systems**

| Model | Samples per grade and per winter and summer period* | |
|---|---|---|
| | **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.

The countries defined as "large" are France, Germany, Italy, Spain and the UK according to the definition contained in the European Standard EN 14274 (greater than 15 million tonnes automotive fuel sales per year). The standard also specifies that individual samples are to be taken at separate refuelling stations. In Member States where sampling also takes place at other points of the distribution chain, the number/proportion of samples taken at refuelling stations needs to be reported.

Definitions of the three statistical models from the standard are presented in Box 2, with the corresponding total sampling requirements previously identified in Table 2.2. In the macro region model (A), regions are defined with similar fuel sales and number of supply sources. For very small countries such as Luxembourg, Malta and Cyprus, where there is basically only supply from one source and it does not make sense to divide the country into separate regions, Model C may be applied. Other Member States have also previously chosen to use Model C and in these cases a clear rationale for its use should be demonstrated on the basis of both number of fuel sources/supply points and size/possibility of division of the territory into regions. Similarly, Member States choosing to use own National Systems should provide information on the fuel supply situation in their country and the statistical confidence of their system in order to demonstrate compliance with Directive 98/70/EC as amended by Directive 2003/17/EC.

**Box 2: Models for the FQMS defined in EN 14274:2003**

For each model, the number of samples per grade per region or macro region (Model A) is obtained by setting the number of samples (diesel fuel and petrol fuel separately) to be proportional to the volume sales within each region, macro region, or sub-region.

Model A – Macro regions

In this model, the regions within the country are grouped (preserving some geographical identity) into macro regions so that they have similar total sales volumes relative to each other and also about the same number of different supply sources. This approach is recommended for countries as it is designed to capture fuel variation efficiently and hence requires a smaller number of samples. If geographical, and destructive or other circumstances do not allow fulfilment of the requirements for the design of this preferred model, Model B shall be considered the next best model.

Model B – Non-macro region

If the construction of macro regions (based on fuel supply patterns) is not possible within the country, then the country shall be divided into regions using only geographic and administrative criteria. To ensure that fuel variability is reliably captured, a large number of samples per grade are required: 100 for small-size countries and 200 for large-size countries.

Model C – Non-region model

If the country is small-sized and when it can be demonstrated that a division into macro regions or non-macro regions is not possible, having considered the procedures and provisions given in this European standard, then the country shall be considered as one region for sampling purposes.

### 2.2.3 Compliance with fuel quality limit values

This section provides details for each grade of fuel sold in the Member State on any non-compliances with the limit values specified in Directive 98/70/EC, and associated and tolerance limits for the test methods. It gives an indication of the number of non-compliances, their magnitude and statistical significance.

Directive 98/70/EC sets test methods, limit values and tolerance limits for a total of 18 parameters for petrol and 5 for diesel. The permitted test methods are those specified in Directive 98/70/EC or EN 228:2000 for petrol and EN 590:2000 for diesel, or later versions.

Each test method has a tolerance limit, based on the reproducibility of the method. The tolerance limit is the value that gives 95% statistical confidence of being equal to the limit value.

For each parameter Member States are required to report the minimum, maximum, mean and standard deviation of values, as per the reporting template. The Directive (and European Standard) does not require Member States to report the test method used for each parameter, although this information is required to confirm whether samples have exceeded limits where there is more than one possible method. Additional information is usually sought from Member States in order to determine compliance with the tolerance limits in these cases, because the test reproducibility (determining the tolerance limit) varies according to each specific analysis. Fields are provided in the Excel reporting template to allow Member States to provide this information with their submission.

This situation has been improved upon for the petrol and diesel distillation limit values in Directive 98/70/EC, for which the European Committee for Standardization (CEN) derived fixed precision statements (reproducibility) based on an extensive analysis of large sets of distillation data of petrol and diesel from national monitoring schemes. As recommended by CEN, these fixed precision statements were incorporated into the Excel reporting template and are now used to determine compliance where the reproducibility of a specific test is unavailable.

To facilitate improved compliance with fuel quality standards, Directive 2003/17/EC states *"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."* The Excel reporting template provides fields for Member States to describe punitive action taken against companies supplying non-compliant fuel.

In evaluating different Member State submissions there are clear variations in trends that emerge. Sample analysis results for different parameters show different trends with regards to levels of compliance with limit values and the range distribution of sample analysis results in relation to the mean and Directive limit values. In some cases the mean of sample values can appear very close to the Directive limit values even without any reported exceedances of these limits by any of the samples. As part of the assessment of the compliance in relation to these analyses it is therefore useful to understand the reasons behind these differences.

Discussion with members of CEN Technical Committee 19, which deals with fuel quality issues, has helped provide valuable insight in this area. A summary of the parameters covered by the Directive and the likely proximity of the market quality to the limit values is presented in Box 3. Essentially there are at least three types of sample analysis distributions associated the different fuel quality parameters:

1. Distributions for properties of relevant "economic" value, e.g. Research Octane Number (RON) for petrol and Cetane Number (CN) for diesel. In this case most results are just above the limit value (95 for RON and 51 for CN) and the distribution of sample analysis results is quite asymmetrical.
2. Distributions for properties that are quite easily fulfilled, e.g. percentage of petrol evaporated at 100°C. In this case the distribution of sample values is more normal (closer to a more typical symmetrical 'bell shaped' distribution).
3. Distributions for properties with tighter limits to be adopted in the near future (e.g. moving from <50ppm to <10ppm sulphur). In this case distributions are again not very normal as the decrease of sulphur content follows strategies that can be different from company to company and from region to region (and from country to country).

There is therefore no typical distribution curve associated with each test method (and these distributions can also change over time). A variety of functions might be generated to describe the distribution, based on the summary data supplied by each Member State, but these would not provide much insight unless one understands what is really motivating the particular refiner to meet the specification. The fuels supplied to many Member States are sourced from quite a wide variety of different companies (and different refineries from the same company). Therefore individual Member State submissions on analysis of sampling carried out across the fuel network will most likely contain a mix of fuels produced by different refineries with varying (and unknown) strategies. This means that the actual distribution curves of sample analysis would vary depending on the combination of these different fuels.

As a result there does not appear to be a suitable way available to statistically verify Member State submission analysis results with a level of demonstrable confidence with the available information currently provided. This would only be possible with the full sample analysis dataset, which would require a very significant additional reporting burden on Member States as well as a considerable increase in submission evaluation effort. There does not appear to be evidence to suggest this level of additional effort would provide significant benefits to the fuel quality monitoring process to warrant consideration.

**Box 3: Likely distribution of samples against fuel quality specifications**

The following provides a brief overview (provided by CEN) of the parameters covered by the Fuel Quality Directive and the likely proximity of the market quality to the maximum or minimum limit value specifications:

**Petrol**

- *Research Octane Number (RON)*: It is usual for a refinery to be tight to specification on either RON or MON - it is unusual to be tight to both specs.
- *Motor Octane Number (MON):* This is usually the most limiting specification for European refineries.
- *Vapour Pressure for the Summer Period:* It is always difficult to meet this specification, whilst maintaining octane and not exceeding the maximum aromatics specification. Refineries try to maximise butane into the blend as it provides high octane but also has a high vapour pressure. The problem is made worse when ethanol is blended to the petrol due to its azeotropic effect causing a rapid increase in vapour pressure. It is therefore expected to see all countries tight to this specification.
- *Distillation:* This is generally not tight to specification, but may change in the future with the blending of ethanol, which causes a shift in the distillation curve.
- *Hydrocarbon Analysis:* Generally refineries will be tight to the maximum aromatics and benzene specifications. Some refineries will be tight to the maximum olefin specification

but this is more unusual.

- *Oxygenates:* Due to the biofuels obligations in Europe there will be a move to be tight to the maximum ethanol, ETBE and oxygen specifications in future years.
- *Sulphur Content:* There are strong economic and supply reliability reasons for refiners to blend tight to the sulphur specifications. The industry tends to run tight to spec to maximise the hydrotreating catalyst lifetime and the energy consumption at the refinery. Thus for a 10ppm max sulphur specification blending is usually targeted around 8ppm max to account for downstream contamination issues in the distribution system where product can interface with 1000ppm gas oil and kerosene. Because of the uncertainty in testing this means that the real blend target can be as low as 6ppm. This is reaching the limit of the desulphurising capacity of the refinery and rapidly increasing energy consumption and reducing the catalyst life. The 10ppm sulphur specification is lower than may be required for many vehicle aftertreatment systems. In the USA legislation has settled on a maximum of 30ppm for petrol and 15ppm for diesel. Therefore, from an environmental perspective running tight to the maximum sulphur specification for sulphur-free fuels should not be construed as an indication of non-compliances.

**Diesel**

- *Cetane number:* There are strong economic drivers to upgrade lower quality high acid crude oils particularly as North Sea crude runs out. These lower quality crudes yield low cetane diesel that is brought up to specification by the use of cetane improver (2 ethyl hexyl nitrate). The cetane improver content is optimised such that cetane will be tight to specification at many refineries.
- *Density:* At the 845 kg/m3 limit for this parameter it is unlikely that many refineries will be consistently tight to this specification unless they have medium/high pressure hydrofining. However, the blending of FAME (density approx 890 kg/m3) is likely to result in density being tighter to the maximum specification in the future as increasing amounts of biofuels will need to be blended with conventional fuels to achieve European biofuel targets.
- *Distillation 95% recovered*: This can be limiting but not all refineries are tight to this specification.
- *Polycyclic aromatic hydrocarbons:* The highest European levels are around 8 - 8.5%, so well under the maximum specification of 11%.
- *Sulphur content:* As for petrol there are strong economic and supply reliability reasons for refiners to blend tight to the sulphur specifications.

## 2.3 Temporal trends

Temporal trends are depicted for each Member State in the form of graphs for total volume of petrol and diesel sold and the percentage of 'regular' (pre-2005), <50ppm and <10ppm sulphur-content fuels, for each year 2001 to 2007.

The information about fuel sales by volume and sulphur content over time, while not required by the Directive/other, is useful to monitor progress towards the Directives' 2005 and 2009 requirements for sulphur-free fuel. The trend graphs have been particularly instructive in showing the rapid conversion to lower sulphur fuel types in most Member States over the period 2001 – 2007, and particularly the low sulphur requirements that commenced in 2005.

The EU25 chapter also includes new trend graphs on a number of reporting and compliance issues, with pairs of graphs for the EU10 (from 2004) and EU15 (from 2001).

## 2.4 Member State Summaries

A summary has been prepared for each Member State listing the key areas for further improvement. The recommendations cover areas such as non-compliance or uncertainty about compliance, EN14274 sampling requirements, reporting issues and fuel availability. Examples of the types of recommendations include:

| Key Areas for Improvement |
|---|
| • MS is not taking sufficient samples to comply with Statistical Model A<br>• MS is only carrying out sampling at refineries and depots. Samples should be taken from refuelling stations.<br>• Sulphur free fuels are not widely available<br>• MS has not provided an explanation for utilising a national FQMS in place of the European Standard or its statistical equivalence to the standard.<br>• MS was X months late in submitting its report<br>• MS is not/only partially compliant with reporting requirements, for example:<br>- The MS did not sample/report all of the required reporting parameters (18 for petrol, 5 for diesel), or<br>- The MS has provided no assessment of the geographical availability of sulphur-free fuels in its territory<br>• MS reported a significant number of non-compliances with limit values (note any particular ones)…indication of actions to be taken? |

# 3 Austria

## 3.1 Fuel Availability 2007

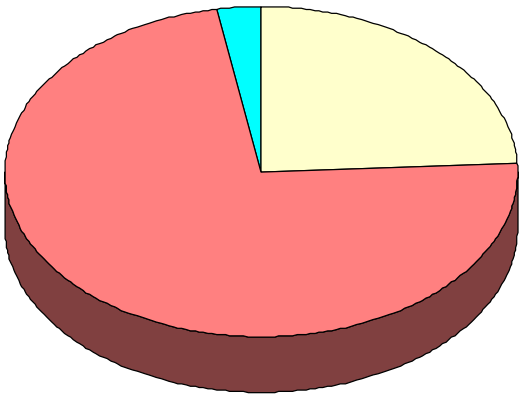
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

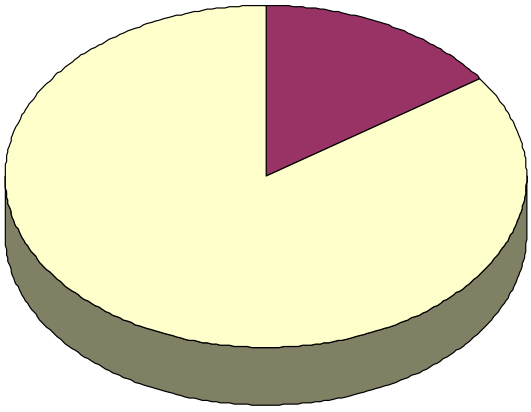
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 3 | RON 91 | <10 ppm | Normal | 3 |
| 6 | RON 95 | <10 ppm | Super | 6 |
| 12 | RON 98 | <10 ppm | Super Plus | 12 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel | 14 |

### 3.1.1 Sales

**Figure 3.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 16% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 24.1% | 15 | Diesel (<10 ppm sulphur) | 84% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 73.0% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 2.8% | | | |

Figure 3.1 clearly shows that RON 91 petrol still accounted for 24.1% of sales in Austria in 2007 (reduced from 30% in 2001). Sales of RON 95 petrol were 73% compared to 65% in 2001, with RON 98 only accounting for 2.8% of sales – a sales figure that has remained

static since 2006. Since 2005 only sulphur free (<10 ppm) petrol has been marketed in Austria.

### 3.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** In 2003 an agreement was made between the Federal Minister for Land, Forest, Environment and Water Management and the General Director of OMV AG (Österreichische Mineralölverwaltung; the Austrian Mineral Oil Administration) that from 1st January 2004 a countrywide availability of sulphur free petrol and diesel will be guaranteed. From February 2004 it has been assumed that S-free fuel was available on a country-wide level from all public petrol stations.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Sulphur free fuels are not labelled, however all petrol is sulphur-free as well as most (84.8%) of the diesel – although this percentage has declined slightly from 86% in 2006.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No.

***Average sulphur content of all petrol and diesel sold:*** From the sample analysis the average sulphur content of the 3 petrol grades has been found to be well below the 10ppm limit, with 7.6ppm for RON91, 7.1ppm for RON 95 and 5.1ppm for RON 98, a slight increase on 2006 average sulphur contents for these fuel grades.

***Additional information:***

Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold.

**Table 3.1: Annual trend in average sulphur content in petrol and diesel fuels**

| AT | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 21 | 17 | 14 | 7 | 5 | 5 | 7 | 18 |
| *Diesel* | 277 | 236 | 213 | 14 | 13 | 10 | 11 | 23 |

## 3.2 Fuel Quality Monitoring 2006

### 3.2.1 Description of system

***Responsible organisation(s):*** Umweltbundesamt GmbH (Environmental Protection Federal Agency Ltd.).

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** In total there are 303 refuelling stations; 150 during the winter season and 153 during the summer half year.

***Time/frequency of sampling:*** Samples were taken equally across the winter and summer periods (50 each) for all grades, except for Grade 12 of which 3 samples were taken in summer only.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** Reporting is made to the Federal Ministry for Economy and Work, according to the Oil - Stocks and Reporting Law via a reporting obligation.

***Other details:*** Austria is served by a single refinery installation (Refinery Schwechat). The production of this refinery accounts for most of the domestic demand. The remaining demand is accounted for by imports from Germany, Italy, Slovakia and Hungary. Data on the regional distribution of the imported fuel in Austria is not available at the current time. The fuel controls carried out in recent years show no regional quality differences from which it can be assumed that there is a continual single quality of imported and domestically produced fuel.

### 3.2.2 Sampling and reporting

Austria was almost fully compliant with the sampling and reporting requirements in 2007, although no geographic availability of fuels was provided. Table 3.2 provides a summary of the sampling and analysis carried out with respect to requirements of Directive 98/70/EC.

**Table 3.2: Summary of sampling and analysis carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 3 | RON 91 <10ppm S | 3 | 24.1% | 50 | 50 | 100 | Yes | All of 18 | (1) |
| 6 | RON 95 <10 ppm S | 6 | 73.0% | 50 | 50 | 100 | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 2.8% | 3 | 0 | 3 | No | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **103** | **100** | **203** | **Yes** | **All of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 15.2% | 50 | 50 | 100 | Yes | All of 5 | (2) |
| 15 | Diesel <10 ppm S | 14 | 84.8% | 0 | 0 | | | | |
| **D** | **Total Diesel** | | **100%** | **50** | **50** | **100** | **Yes** | **All of 5** | **(2)** |

**Notes:** S = Summer; W = Winter
(1) Sulphur contents - some exceedances of 10ppm limit but compliant with the Directive limit of 50ppm
(2) Sulphur Value of 194 - exceeds <50 Tolerance Limits

### 3.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Normal Petrol***

*Detail:* One or more samples exceeded the limit values for MON, DVPE, Distillation evaporated at 150oC and Aromatics, giving values, respectively of; 82.4, 61kPa (summer value), 74 %(v/v) and 35.3 %(v/v).

*Statistical significance:* All sample values were within tolerance limits of the Directive and so there were no non-compliances.

***Super Petrol***

*Detail:* One or more samples exceeded the Directive limit values for RON (94.6), MON (84.8 and 84.6) and Aromatics (35.1%v/v).

*Statistical significance:* The tolerance limits for statistical significance for the test methods used for RON (94.6), MON (84.5), and Aromatics (36.0 %v/v) were not exceeded and these samples were compliant with the Directive.

***Super Plus Petrol***

| | |
|---|---|
| *Detail:* | No samples were non-compliant with Directive 98/70/EC limit values for Petrol grade 12; Unleaded Petrol (RON 98) and therefore none exceeded tolerance limits for the Directive. |

***Diesel***

| | |
|---|---|
| *Detail:* | Cetane number limit value (minimum 51) was exceeded by one or more samples with a minimum of 50.9. There were also exceedances of the limiting values for Distillation (95-%-Point) and Sulphur content with values of 371 and 194. |
| *Statistical significance:* | The tolerance limit for the Directive was exceeded by two samples. Distillation (95-%-Point) exceeded the tolerance limit of 365.9°C whilst one sulphur sample was non-compliant with the Directive giving a value of 194 mg/kg. |
| *Member State's notes:* | Samples which gave values outwith the tolerance limit were detained by the member state. |

***Additional information***: In addition to the above non-compliances with the Directive, there were at least three exceedances of the <10 mg/kg sulphur content limit value (of 10mg/kg) for petrol fuels marketed as sulphur-free, with samples giving sulphur content values of 14.8 mg/kg and 14 mg/kg (Normal Petrol, RON 91) and 21.4 mg/kg and 10.9 mg/kg (Super Petrol, RON 95). However, all samples were within the absolute sulphur content limit of 61.8 mg/kg and so all were compliant with the Directive.

## 3.3 Temporal trends

Figure 3.2 to Figure 3.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Total sales of petrol have slightly decreased by 4% since 2005, although figures for diesel in 2007 show a slight increase in sales of 2%. Sales of petrol have all converted to sulphur-free (< 10 ppm) grades and sulphur free diesel also now makes up the majority of diesel sales (86%).

**Figure 3.2: Temporal trends in national sales of petrol and diesel (million litres)**

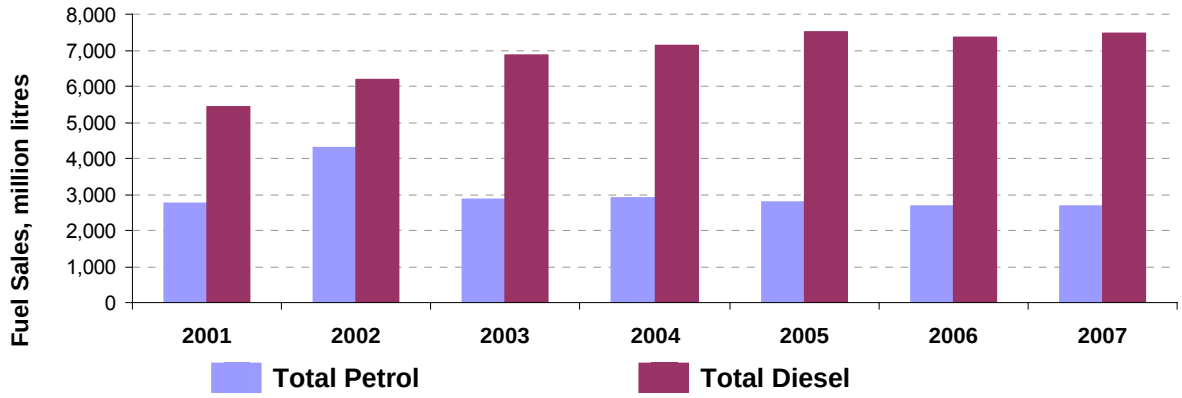


**Figure 3.3: Temporal trends in national sales of low sulphur petrol (%)**

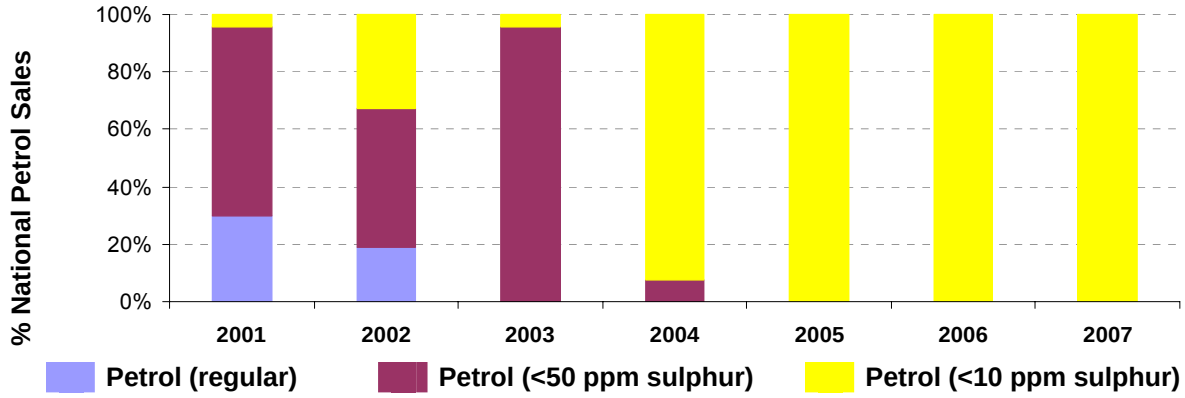



**Figure 3.4: Temporal trends in national sales of low sulphur diesel (%)**

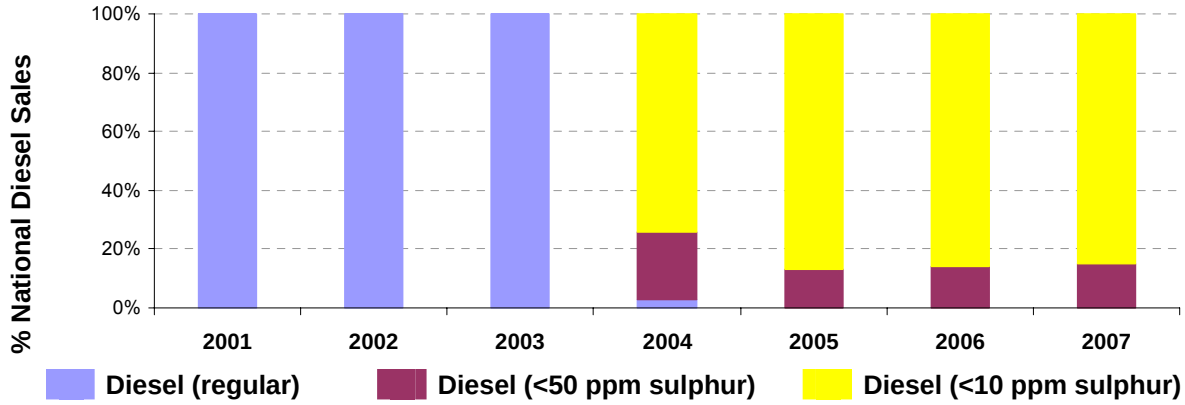
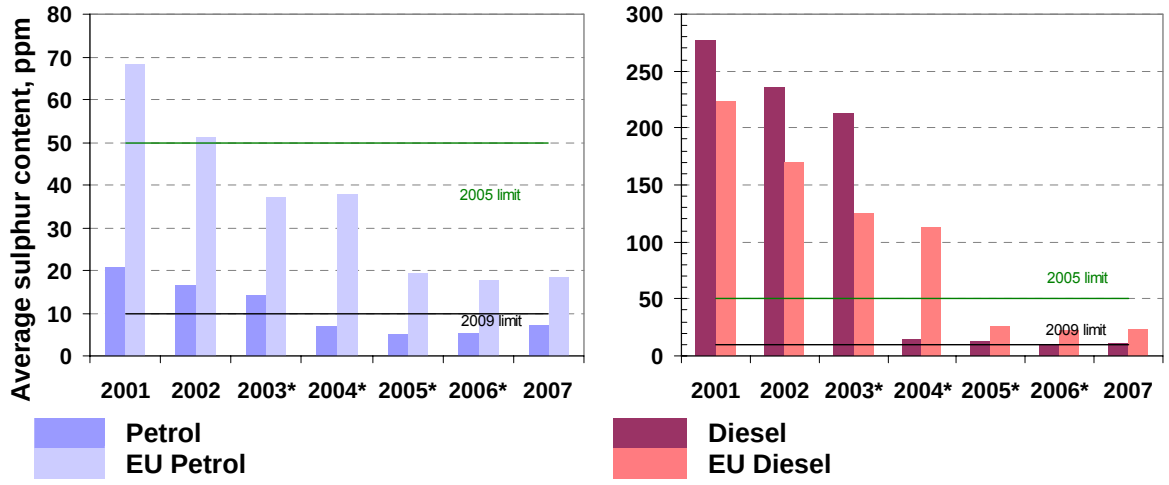



Figure 3.1 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). The reduction in average sulphur content of both petrol and diesel fuels since 2001 continued in 2005 with full market conversion to <10ppm fuels of petrol in 2005. The average sulphur content was well below the 2005 limit, the EU average and the forthcoming 2009 limit.

**Figure 3.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006; and includes new EU10 Member States from 2004.

## 3.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
| --- |
| • Austria has stated that it uses Statistical Model C, however this does not appear entirely consistent with the European Standard specification (discussed in section 2.2.2). Instead statistical Model A seems more appropriate, which would require further information to be reported on sample numbers in different regions.<br>• The member state does not give details of samples or subsequent action resulting from non-compliance with the directive. |

# 4 Belgium

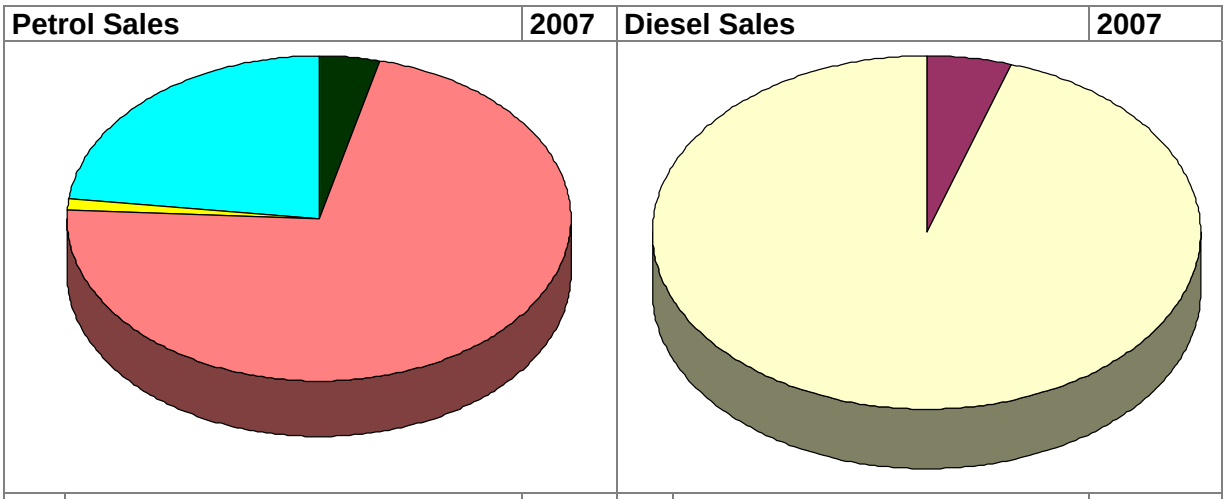
## 4.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Eurosuper 50s | 5 |
| 6 | RON 95 | <10 ppm | Eurosuper 10s | 6 |
| 11 | RON 98 | <50 ppm | Super+ 50S | 11 |
| 12 | RON 98 | <10 ppm | Super+ 10S | 12 |
| 14 | Diesel | <50 ppm | Diesel 50S | 14 |
| 15 | Diesel | <10 ppm | Diesel 10S | 15 |

### 4.1.1 Sales

**Figure 4.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 5.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 95.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 3.8% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 72.0% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 1.2% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 23.0% | | | |

Figure 4.1 above shows that there has been an increase in sales of RON 95 <10ppm fuels (72% in 2007 in comparison with 34.5% in 2006). This increase has resulted from a marked

decline in RON 95 <50ppm fuels in Belgium (40% in 2006 reduced to 3.8% of sales in 2007). Remaining petrol fuel sales of RON 98 have shown a similar transition, from equal sales of RON 98 <10ppm and RON 98 <50ppm (12.8%) in 2006 to 1.2% RON 98 <50ppm and 23% RON 98 <10ppm sales in 2007. In the 2006 reporting period, low sulphur diesel (<50ppm) fuel sales represented 90.7% diesel sales; 2007 reporting shows a transition largely to sulphur free diesel (<10ppm) with sulphur free diesel sales now comprising 95% of all diesel sales.

### 4.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur-free fuels (<10ppm) represent the majority of sales in Belgium. The use of <10ppm fuel instead of <50ppm fuel is stimulated by the government through taxes.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** <10ppm fuels are marked separately from <50ppm fuels in the quality certificates. Sulphur-free grades are also marked separately at the fuel pump.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** see Table 4.1.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 4.1: Annual trend in average sulphur content in petrol and diesel fuels**

| BE | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 68 | 44 | 42 | 33 | 14 | 11 | 7 | 18 |
| *Diesel* | 269 | 47 | 40 | 40 | 31 | 24 | 9 | 23 |

## 4.2 Fuel Quality Monitoring 2007

### 4.2.1 Description of system

***Responsible organisation(s):*** FAPETRO (Fonds d'Analyse des produits Pétroliers), which is part of the Federal Public Service for the Economy, Small and Medium-sized Enterprises, Small Traders and Energy, formerly the Ministry of Economic Affairs.

***Format of Fuel Quality Monitoring System (FQMS):*** National System

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations; Belgium analyses fuel samples taken from both publicly available distribution chains and private distribution chains.

***Time/frequency of sampling:*** Low sulphur (<50ppm) petrol and diesel samples were collected in the winter period only. Sulphur free fuels (petrol and diesel) samples were taken regularly throughout the year.

***Specification of test methods:*** All test methods used in accordance with the Directive.

***Collection of sales data:*** No information provided.

***Other details:*** Belgium's monitoring system was introduced in 1996 and this monitoring system allows fraud to be detected for individual products.

### 4.2.2 Sampling and reporting

Belgium was for the most part compliant with the sampling and reporting requirements in 2007, although no information on oxygen content was reported for all petrol and lead content was not reported for low sulphur (<50ppm) fuel grades. All parameters were reported for diesel fuel analysis. As with 2006 reporting, there was no separate reporting for summer and winter and no information was provided on equivalence of the Belgian Fuel Quality Monitoring System to the requirements of EN 14274. However, sampling numbers are extremely high in comparison to other Member States (see below) as Belgium takes a large number of samples to ensure fuel quality. It is therefore safe to say their system is of a higher statistical confidence than the minimums set out in the Directive. Belgium imposes more severe national fuel quality limits than required by the Directive. Member state submissions are assessed according to the limits as set out in Directive 98/70/EC.

The following Table 4.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 4.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 3.8% | 0 | 116 | - | No | 10 of 18 | (1) |
| 6 | RON 95 <10 ppm S | 6 | 72.0% | 1189 | 1194 | - | No | 10 of 18 | (1) |
| 11 | RON 98 <50 ppm S | 11 | 1.2% | 0 | 113 | - | No | 10 of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 23.0% | 1085 | 1098 | - | | | |
| **P** | **Total Petrol** | | **100%** | **2274** | **2521** | **-** | **No** | **10 of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 5.0% | 0 | 600 | - | No | 5 of 5 | (2) |
| 15 | Diesel <10 ppm S | 15 | 95.0% | 2236 | 2768 | - | No | 5 of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **2236** | **3368** | **-** | **No** | **5 of 5** | **(2)** |

**Notes:** S = Summer; W = Winter

(1) Oxygen content has not been reported for all four reporting petrol grades. DVPE was not reported for RON 98 <50ppm fuels (fuel category 11) and low sampling values for MON, Benzene and Sulphur were reported for this fuel.

(2) Belgium has not reported Cetane Number - which is a requirement of the Directive. Instead values for Cetane Index using test method EN ISO 4264 have been reported.

### 4.2.3 Compliance with fuel quality limit values

Oxygen content was not reported for all four petrol grades; Lead content was not reported for low sulphur fuel grades (RON 95 <50 and RON 98 <50).

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95 <50 ppm***

| | |
|---|---|
| *Detail:* | The Limiting value for Aromatics of 35% (v/v) was exceeded by one sample with a value of 35.3% (v/v). |
| *Statistical significance:* | The Tolerance Limit for statistical significance for Aromatics is 36% (v/v) therefore the sample was compliant with Directive limits. |
| *Member State's notes:* | All the samples taken at the public distribution chains were compliant. The infringements reported by Belgium occurred in samples from private distribution chains. |

***Petrol RON 95 <10 ppm***

| | |
|---|---|
| *Detail:* | The limit values for RON; minimum 95, MON; minimum 85, vapour pressure; maximum 60 kPa, Olefins; 18 % (v/v), Aromatics; 35 % (v/v), Ter-butyl alcohol 7 % (v/v), Iso-butyl alcohol; 10 % (v/v), ethers; 15 % (v/v) and other Oxygenates; 10 % (v/v) were exceeded by samples giving values of 57.1, 81.4, 85.5% (v/v), 34.4% (v/v), 41% (v/v), 13.54% (v/v), 10.8% (v/v), 15.8% (v/v) and 13.77% (v/v) respectively. |
| *Statistical significance:* | The tolerance limit for statistical significance for MON is 84.5 and so the sample with a MON value of 81.4 was within tolerance limits and therefore compliant with the Directive.<br><br>The tolerance limit for statistical significance for RON (94.6) was exceeded by 16 samples out of 2383 (0.67%). The tolerance limit for Ethers was exceeded by one sample with a value of 15.8 % (v/v).<br><br>No sample exceedance details have been provided for vapour pressure, Olefins, Aromatics, Tert-butyl alcohol, Iso-butyl alcohol and Other Oxygenates, all maximum values reported exceeded tolerance limits and therefore those samples were non-compliant with the Directive. |
| *Member State's notes:* | Most samples were compliant with the Directive. Less than 2 % of samples in the public distribution chains showed non-compliance. |

***Petrol RON 98 <50 ppm***

| | |
|---|---|
| *Detail:* | No samples exceeded Limiting Values or Tolerance Limits and so were all compliant with the Directive. |

***Petrol RON 98 <10 ppm***

| | |
|---|---|
| *Detail:* | The limiting values for MON; 85, Vapour Pressure; 60kPa, Olefins; 18 % (v/v), Aromatics; 35% (v/v), Benzene; 1 % (v/v), Ethers 15 % (v/v) and Sulphur content were all exceeded by one or more samples. |

***Petrol RON 98 <10 ppm***

*Statistical significance:* The tolerance limit for statistical significance for MON is 84.5 and so the sample of 84.5 was compliant with the Directive. The tolerance limits for Aromatics and Benzene (35 % (v/v) and 1% (v/v), respectively) were not exceeded by samples giving values of 35.3 and 1.1 % (v/v).

The tolerance limit for statistical significance for vapour pressure; 61.8 kPa was exceeded by at least one sample (92.6 kPa), which was therefore non-compliant with the Directive.

13 samples exceeded the tolerance limit for Olefins of maximum 21.8 and were non-compliant with the Directive.

3 samples of ether exceeded the tolerance limit for statistical significance of 15.6 % (v/v) and were therefore non-compliant with the Directive.

*Member State's notes:* 3 values out of 2183 (0.14%) were higher than the maximum tolerance limit for ether and for olefins only 0.6% of values were out of specification.

*Additional notes:* 3 samples of the 92 tested exceeded the sulphur content value of 10mg/kg for a sulophur free fuel. All samples were compliant with the overall Directive sulphur content limit and so all were comlpiant with the Directive.

***Diesel <50 ppm***

*Detail:* Sulphur content limit values have been exceeded by 2 samples for public distribution chains and 12 samples for private distribution chains– with an extreme value of 73.8 mg/kg.

*Statistical significance:* All samples that exceeded the low sulphur tolerance limit of (maximum) 61.8 were non-compliant with the Directive.

*Member State's notes:* Belgium tests both public and private fuel stations (only public refuelling station testing is a requirement of the Directive) and rigorous testing results in comparably high non-compliant samples (in comparison to other member states). The cetane number is the calculated cetane number using test method EN ISO 4264 and not the measured cetane number.

***Diesel <10 ppm***

*Detail:* Distillation 95% point limiting value of (maxiumum) $360^0$C was exceeded by at least one sample with a value of $366.4^0$C.

*Statistical significance:* The proportion of non-compliant Distillation 95% samples in Belgium was 0.46%.

*Member State's notes:* 23 values of 5004 (or 0.46%) for distillation 95% point are out of specification. Belgium tests both public and private fuel stations (only public refuelling station testing is a requirement of the Directive) and rigorous testing results in comparably high non-compliant samples (in comparison to other member states).

The cetane number reported by Belgium is the calculated cetane number and not the measured cetane number.

6 % of the values for the parameter sulphur content are out of specification.

***Additional information***: In addition to the above non-compliances with the Directive, there were three samples of the national diesel sulphur-free grade that exceeded the <10ppm sulphur content limit (for diesel fuel marketed as sulphur-free) with a maximum sulphur content of 22.6 ppm.

## 4.3 Temporal trends

Figure 4.2 to Figure 4.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales.

Total sales of petrol have decreased by 33% since 2001, whilst sales of diesel have increased by 20%. It is worth mentioning that information on the proportion of sales being sulphur-free (95% for petrol, 95% for diesel) is based upon estimates.

**Figure 4.2: Temporal trends in national sales of petrol and diesel (million litres)**

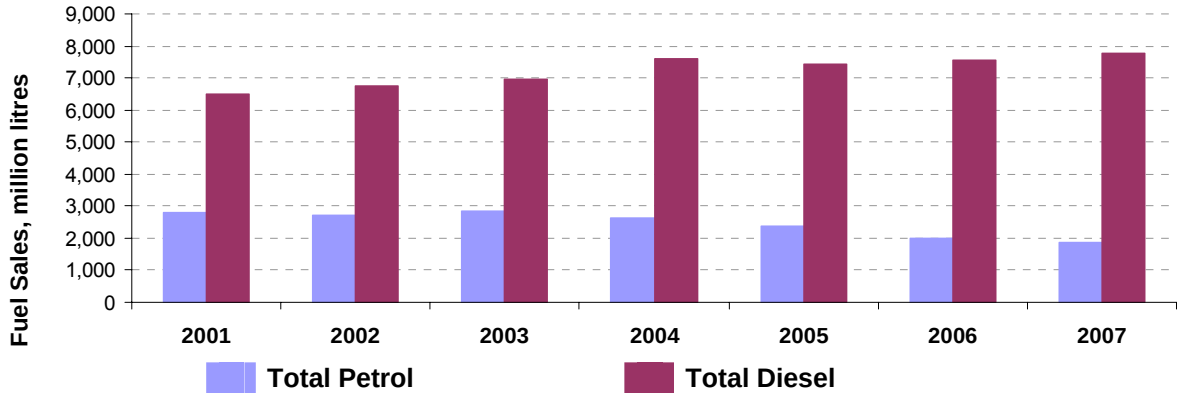



**Figure 4.3: Temporal trends in national sales of low sulphur petrol (%)**

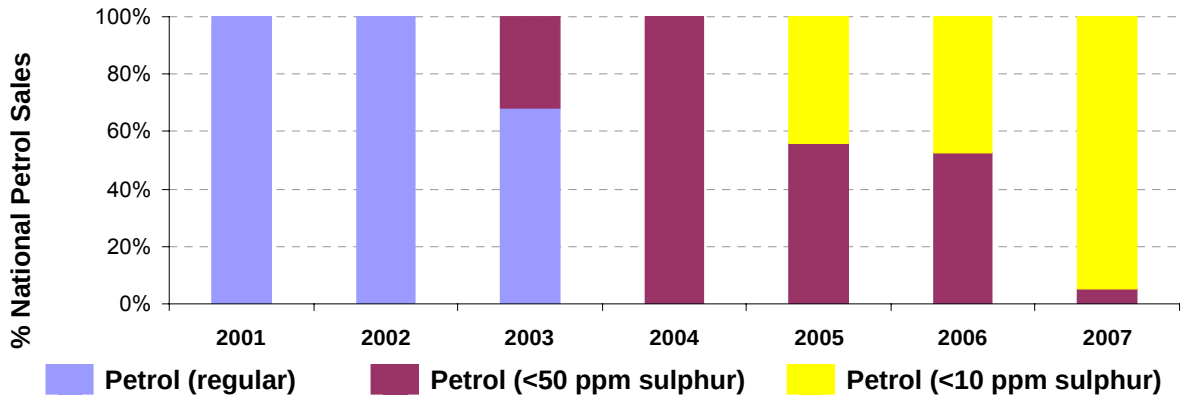


**Figure 4.4: Temporal trends in national sales of low sulphur diesel (%)**

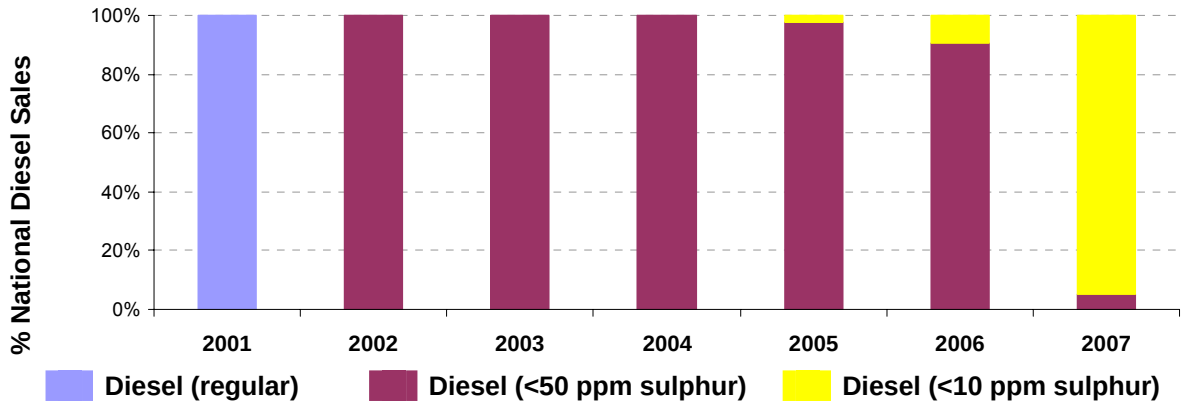
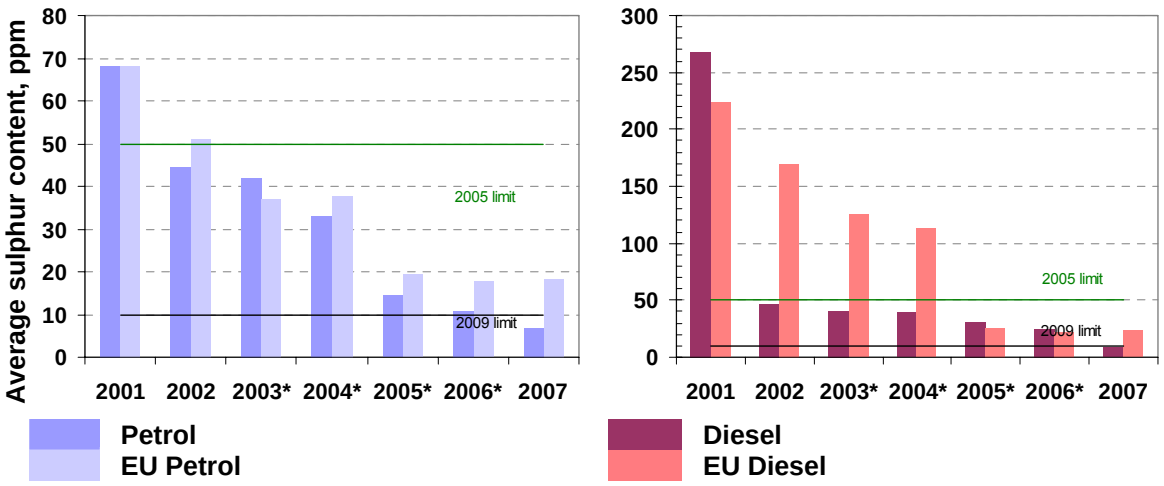



Figure 4.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Average sulphur content of petrol has reduced by about half since 2004 and continued to reduce to reach the level below the EU average in 2007. Diesel sulphur levels were below the EU average and have reduced more than half since 2006. The average sulphur content was well below the 2005 limit and also below the forthcoming 2009 limit.

**Figure 4.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006; and includes new EU10 Member States from 2004.

## 4.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Belgium has reported a higher proportion of non-compliant samples than other Member States – due to the quantity of samples tested and reported on by Belgium, and the proportion from non-public refuelling stations.<br>• Summer and winter results should be reported separately.<br>• Information for oxygen content for all four petrol grades was missing, as was lead content for low sulphur (<50ppm) fuels. |

# 5 Bulgaria

Bulgaria joined the EU in 2007 and although the Member State reported on monitoring in 2006, this is the first year that Bulgaria is required report on monitoring.

## 5.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

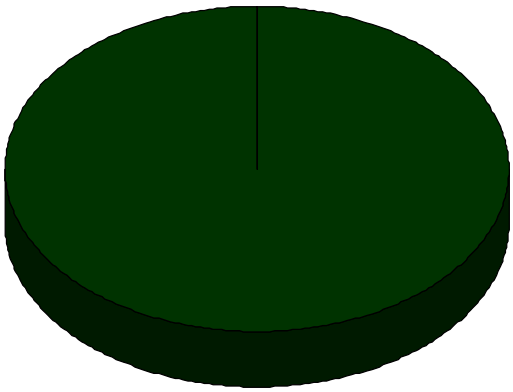
Note that Bulgaria joined the European Union on 1 January 2007. Therefore before that time, the 50ppm sulphur limit under the Directive did not apply. Bulgaria has advised that since EU accession, only low sulphur and sulphur free fuels have been marketed in its territory.

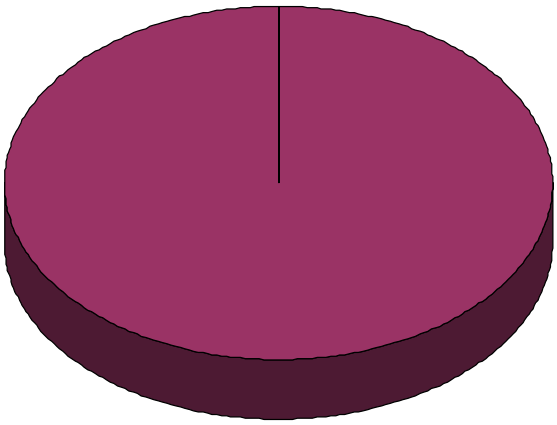
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | A-95 | 5 |
| 14 | Diesel | <50 ppm | Diesel | 14 |

### 5.1.1 Sales

**Figure 5.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2006 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 100.0% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 5.1 shows that the all petrol sold in Bulgaria in 2007 was of low sulphur (<50 ppm). Diesel sales are also 100% low sulphur quality.

Note: Bulgaria has reported that sulphur free fuels were on sale in 2007; however no sales data or sampling breakdown was available in the reporting period for 2007.

### 5.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** From 2007 the producers and/or importers of liquid fuels are required to provide petrol and diesel fuel with maximum sulphur content of 10 mg/kg. Sulphur free fuel is sold in fuel stations with a capacity of over 1,000$m^3$ yearly for each fuel on sale. However, sales data and the proportion of sulphur free fuel sales are not currently available. All other available fuels (petrol and diesel) are low sulphur.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No information given.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No.

***Average sulphur content of all petrol and diesel sold:*** Table 5.1 shows the average content of fuel sold from 2005 to 2007 in relation to the EU27 average. Prior to 2007, Bulgaria was not required to meet maximum sulphur content limits. Having joined the EU in 2007, Bulgaria is now obliged to meet sulphur limits and the average sulphur content for both petrol and diesel has fallen dramatically.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 5.1: Annual trend in average sulphur content in petrol and diesel fuels**

| BG | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | | 131 | 137 | 19 | 18 |
| *Diesel* | | | | | 246 | 468 | 22 | 23 |

## 5.2 Fuel Quality Monitoring 2007

### 5.2.1 Description of system

***Responsible organisation(s):*** Ministry of Environment and Water and State Agency for Metrological and Technical Surveillance (SAMTS) – Directorate General "Quality control of liquid fuels"

***Format of Fuel Quality Monitoring System (FQMS):*** National system, based on EN 14274.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** The relevant period for assessment of compliance is 1st May to 30th September (Normal), however the official national period is 15th April – 15th October.

***Location(s) of sampling:*** Public and private refuelling stations across the Bulgarian territory.

***Time/frequency of sampling:*** Samples were taken regularly throughout the year and were taken upon request of various bodies and private persons.

***Specification of test methods:*** All test methods according to those mentioned in the Directive for all available testing equipment. Sulphur content - according to the requirements of EN ISO 8754 due to the available equipment.

***Collection of sales data:*** The National Statistic Institute is responsible for the collection of data on fuel consumption.

**Additional information:** The Bulgarian Fuel Quality Monitoring System was introduced on 1st October 2003 when the national Clean Air Act and the Regulation on liquid fuels quality and procedures and methods of their control were regulations adopted.

The Regulation implements the requirements of the Directive 98/70/EC and 2003/17/EC. On the basis of the Regulation, the Directorate General "Quality control of liquid fuels" was created. The Directorate consists of three regional departments for control of collecting samples: one department for testing fuels with its own laboratory having one stationary and two mobile departments which will be accredited within the next monthsl and one department for control, issuing the experts' conclusion about the compliance/non compliance of the tested fuels. Regional control department staff are spread out all over the country and are located in 7 main towns. The stationary department of the laboratory is located in Sofia and each one of the two mobile laboratories will perform tests in the north and in the south of the country respectively.

Thanks to the realization of the European Aid Project 121584/D/S/BG (PHARE project BG 2003/004-937.02.01) during the year 2007, the laboratory for the testing of fuels within the State Agency for Metrological and Technical Surveillance was supplied with the necessary equipment for establishment of the parameters, requested by the Decision 2002/159/EC and Directive 98/70/EC amended by Directive 2003/17/EC. The equipment supplied under the above mentioned project was installed and staff were trained. During 2007, the laboratory of the Directorate General "Quality control of liquid fuels" started the procedure for reaccreditation and widening the scope of accreditation by the Bulgarian Accreditation Service including the equipment supplied under European Aid Project 121584/D/S/BG. The procedure for the accreditation will be completed over the coming months.

### 5.2.2 Sampling and reporting

Table 5.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC. Bulgaria has adopted a nationally defined Fuel Quality Monitoring System as outlined above. Sampling quantities are low and not equivalent to the reporting requirements of the Directive. However this may be due to the fact that the reaccreditation procedure of testing laboratories (as detailed above) had not been finalised prior to report submission and may show an improvement in the 2008 reporting period.

**Table 5.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 100.0% | 17 | 17 | - | Yes | 13 of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **17** | **17** | **-** | **Yes** | **13 of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 14 | 24 | - | Yes | 3 of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **14** | **24** | **-** | **Yes** | **3 of 5** | **(2)** |

**Notes:** S = Summer; W = Winter

(1) On the basis of the established non-compliances 7 penalties acts were issued with total fines amounting to 75 000 Euro.

(2) Parameters not analysed included: Polycyclic aromatic hydrocarbons and cetane number. Instead of cetane number, the cetane index was evaluated and reported on

### 5.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* The limiting values for Distillation at 100* (Minimum 46 % (v/v) Aromatics (35 % (v/v), Benzene (1 % (v/v), Ethanol (5 % (v/v), Iso-Propyl Alcohol (10 % (v/v) and Tert-Butyl Alcohol (7 % (v/v) were all exceeded by one or more samples.

*Statistical significance:* Three Distillation at 100°C samples exceeded the tolerance limit for the parameter (minimum 43.6 % v/v) with a minimum value of 42.5) and were therefore non-compliant with the Directive.

The tolerance limits for statistical significance of Aromatics (37.2% (v/v), Benzene (1.1% (v/v), Ethanol (5.2% (v/v), 1xIso-Propyl Alcohol (10.5% (v/v) were all exceeded and were therefore non-compliant with the Directive.

At least 1xTert-Butyl Alcohol sample exceeded the tolerance limit of 7.4% (v/v) and was therefore non-compliant with the Directive.

*Member State's notes:* All non-compliant samples were issued with a Penalty Act except Tert-Butyl Alcohol.

***Diesel***

*Detail:* The limiting value for Distillation –95-%-Point (360 °C) was exceeded.

*Statistical significance:* The tolerance limit for statistical significance (365.9 °C) was exceeded by two Distillation –95-%-Point samples, with a maximum value of 372 °C and were therefore non-compliant with the Directive.

*Member State's notes:* Non-compliant samples were issued with a Penalty Act.

## 5.3 Temporal trends

Figure 5.2 to Figure 5.5 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. All fuel sales were of <50ppm fuel grades, Bulgaria joined the EU in 2007.

**Figure 5.2: Temporal trends in national sales of petrol and diesel (million litres)**

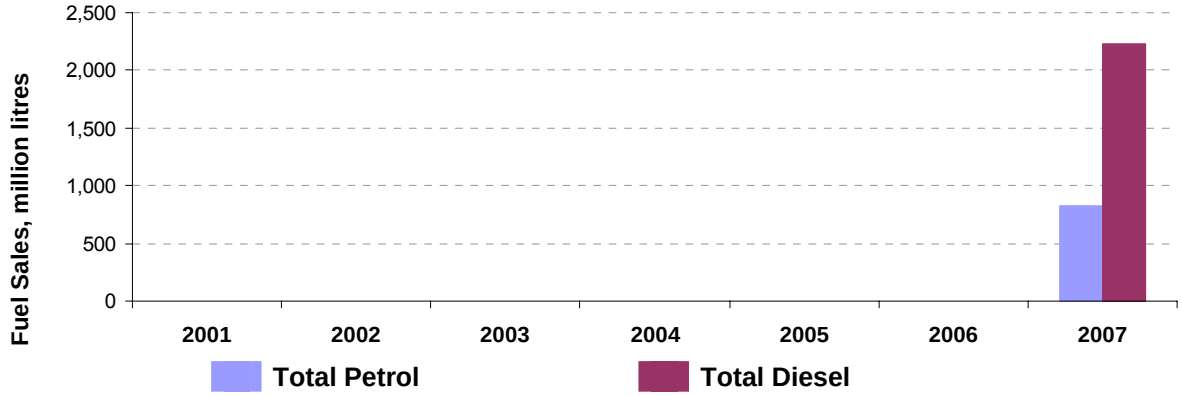



**Figure 5.3: Temporal trends in national sales of low sulphur petrol (%)**

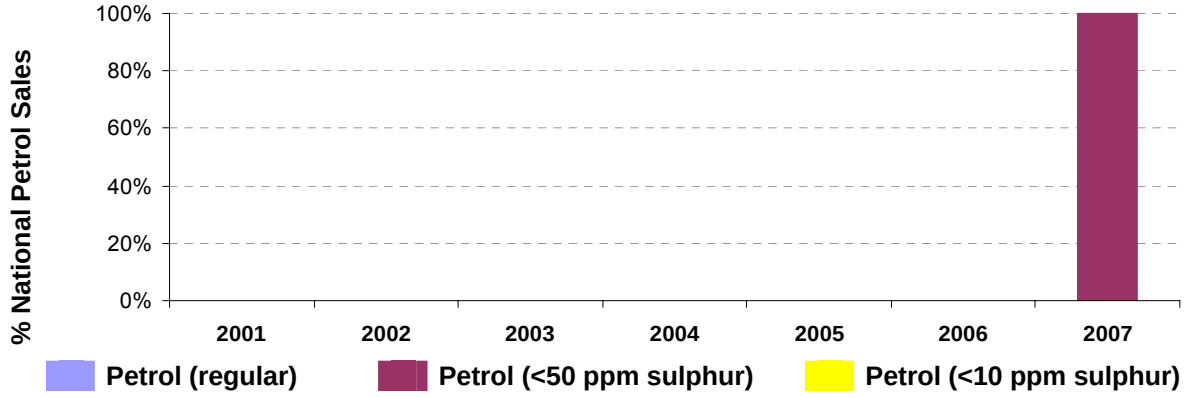



**Figure 5.4: Temporal trends in national sales of low sulphur diesel (%)**

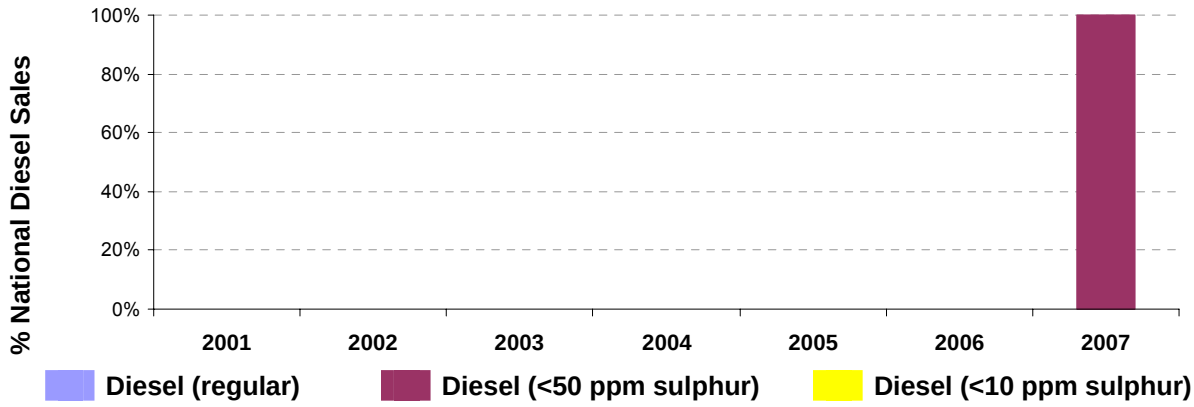
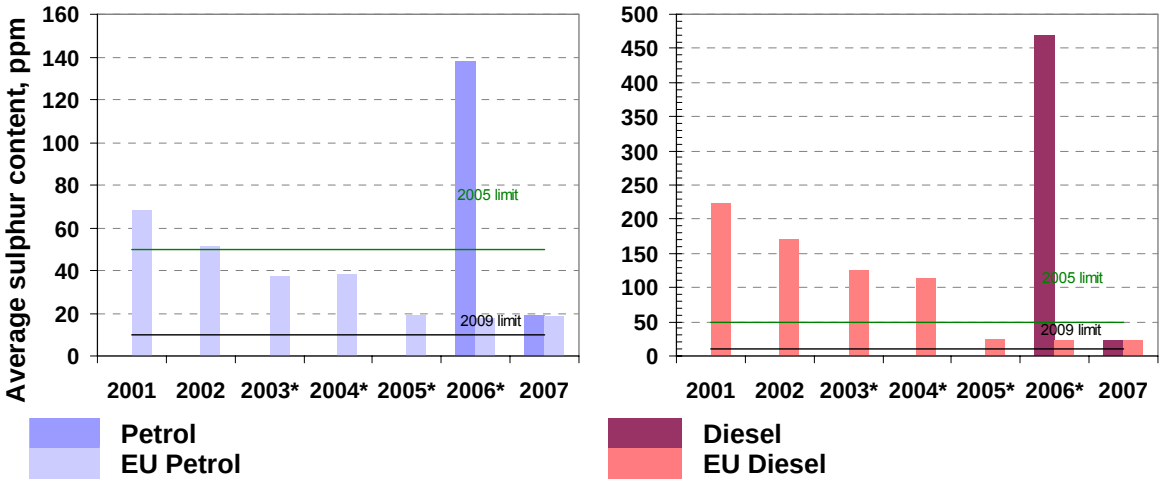



Figure 5.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Bulgaria did not need to comply with the EU < 50ppm limit on sulphur in 2006, as it did not join the EU until 2007. Bulgaria converted its petrol and diesel market to < 50 ppm in 2007. The average sulphur content of both petrol and diesel fuels in 2007 was well below the 2005 limit, but the EU average was slightly exceeded.

**Figure 5.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006; and includes new EU10 Member States from 2004.

## 5.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Bulgaria was partially compliant with sampling and reporting requirements compared to the European Standard as:<br>- Separate sales data was not provided for different RON petrol grades.<br>- Sulphur free fuels are on sale in Bulgaria, but have not been sampled or reported on.<br>- Insufficient samples were taken of the fuel grades.<br>- Not all of the required parameters were analysed.<br>• Bulgaria has not provided the European Standard statistical model basis for its national FQMS.<br>• Data on the national consumption of diesel fuel includes diesel refueled abroad as well as used in Bulgarian navigation marine diesel and gas oil. |

# 6 Cyprus

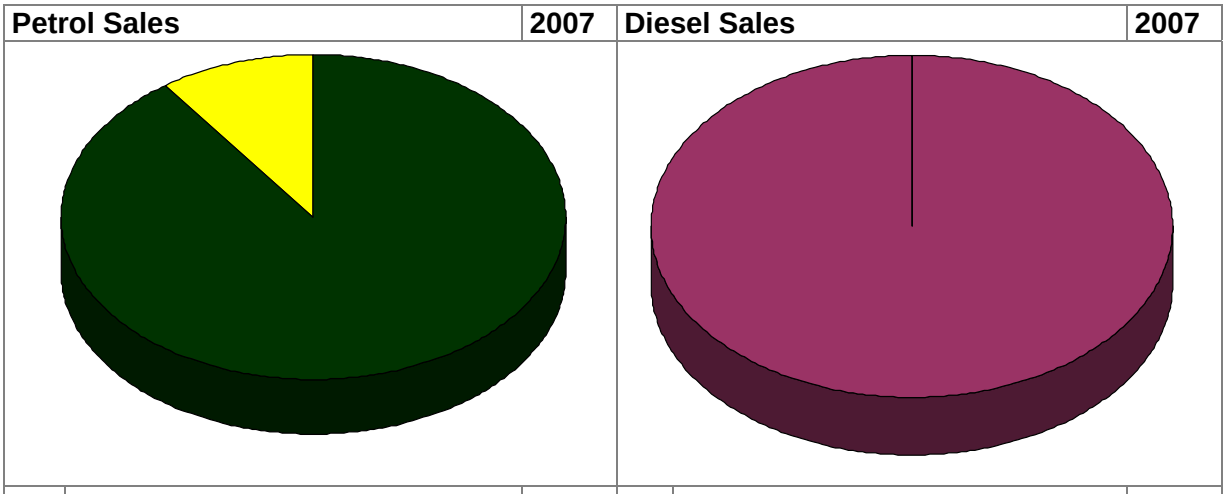
## 6.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Unleaded RON 95 | 5 |
| 11 | RON 98 | <50 ppm | Unleaded RON 98 | 11 |
| 14 | Diesel | <50 ppm | Diesel | 14 |

### 6.1.1 Sales

**Figure 6.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 89.9% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 10.1% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 6.1 shows that the majority of fuel available in 2007 in Cyprus was RON 95 (89.9%, an increase on the figure of 86.5% in 2005) and that no specific sulphur-free grades of petrol or diesel were available.

### 6.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** No sulphur free fuels were available in Cyprus in 2006 or 2007, in breach of the Directive requirements.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** N/A, none available.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** N/A.

***Average sulphur content of all petrol and diesel sold:*** Table 6.1 shows the average content of fuel sold in relation to the EU25 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 6.1: Annual trend in average sulphur content in petrol and diesel fuels**

| CY | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 70 | 30 | 28 | 24 | 18 |
| *Diesel* | | | | 197 | 46 | 24 | 32 | 23 |

## 6.2 Fuel Quality Monitoring 2007

### 6.2.1 Description of system

***Responsible organisation(s):*** Energy Service of the Ministry of Commerce, Industry and Tourism

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** The relevant period for assessment of compliance is 1st May to 30th September (Normal), however the official national period is 1st May – 31st October.

***Location(s) of sampling:*** Refuelling stations and terminal

***Time/frequency of sampling:*** Diesel was sampled monthly throughout the year in 2007; two petrol grades were sampled 11 months of the year.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** From Oil Companies and the statistical service of Cyprus.

***Other details:*** Cyprus is depended solely on imported petroleum products. Retail site (petrol stations) samples were taken by the inspectors of the Energy Service on a daily surveillance program prepared by the Chief Inspector and/or his Assistant. The petrol stations (from which samples are taken) are selected from the list of petrol stations based on the volume of sales and the geographical location.

The number of petroleum shipments imported determined the number of samples taken from the Larnaca depot. All petroleum products held by the CPSC are tested in order to secure their compliance with the EU specifications.

Bearing in mind that Cyprus is considered as a single region and the supply, distribution and retail of petroleum products are carried out only by the four marketing companies, which are utilizing a single depot, the number of the samples taken in 2007 was adequate to monitor the Cyprus distribution chain.

According to a new ministerial Order issued on 26/05/2006, the seasonal transition period (from the summer to winter and vise versa) extended from 4 weeks to 8 weeks.

At the end of 2006, the Ministry of Commerce, Industry and Tourism signed a contract with a Greek company for the supply of a mobile lab. The Energy Service received the mobile lab in May 2007 and since then the mobile lab is the main laboratory that conducts the tests regarding the fuel quality of fuels marketed Cyprus. The Mobile Lab consists of 7 fully automatic analyzers that can define almost all the main parameters of diesel and petrol. The Mobile Lab will be accredited as a fuels laboratory, based on the CYS EN ESO/IEC 17025:2005 standard, in approximately one year from now.

### 6.2.2 Sampling and reporting

Cyprus was almost fully compliant with the sampling and reporting requirements in 2007. One petrol parameter (Iso-butyl alcohol) was not sampled for any petrol grades - the reason given for this is that "the iso-butyl concentration cannot be determined with the existing apparatus". Table 6.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 6.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Category | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 89.9% | 86 | 88 | 100 | Yes | 17 of 18 | (1) |
| 11 | RON 98 <50 ppm S | 11 | 10.1% | 78 | 94 | 100 | Yes | 17 of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **164** | **182** | **200** | | | |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 86 | 178 | 100 | Yes | 5 of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **86** | **178** | **100** | | | |

**Notes:** S = Summer; W = Winter

(1) Parameter missing: Iso-butyl alcohol analysis and reporting. Report states: The iso-butyl concentration cannot be determined with existing apparatus

(2) Two samples gave values of 123.5 mg/kg and 122.8 mg/kg for Sulphur report states that the non-compliance resulted in Penal Prosecution

### 6.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:*

One or more samples exceeded the minimum limit value for Research Octane Number (RON) of 95 and the minimum limit value for Motor Octane Number (MON) of 85.

Summer vapour pressure limit value (60 kPa) was exceeded by some samples, with a maximum value of 63.4 kPa.

One or more samples exceeded the limit value for Olefins of 18 % (v/v).

| | |
|---|---|
| *Statistical significance:* | The tolerance limit for statistical significance for the vapour pressure test method (61.7 kPa) was exceeded by two summer samples (63.4kPa and 62.8kPa), and was therefore non-compliant with the Directive.<br>The tolerance limit for statistical significance for RON, MON and Olefins were not exceeded and therefore these samples were in compliance with the Directive. |
| *Member State's notes:* | According to a new ministerial Order issued on 26/05/2006, the seasonal transition period (from the summer to winter and vice versa) extended from 4 weeks to 8 weeks. Any variations of the vapour pressure specifications regarding RON 95 and 98 samples were within the transition period from winter to summer specifications. |

***RON 98 Petrol***

| | |
|---|---|
| *Detail:* | The limiting value for vapour pressure test method (60 kPa) was exceeded for some samples.<br>One or more samples exceeded the limiting value for Distillation at $150^0$C of 75 % (v/v) the Oxygen Content limiting value of 2.7 % (m/m) and the limiting value of Ethers with ≥5 carbon atoms / molecule at 15 % (v/v). |
| *Statistical significance:* | The tolerance limits for statistical significance for all samples were not exceeded; therefore the samples were in compliance with the Directive. |
| *Member State's notes:* | Variations on vapour pressure as for RON 95 petrol. |

***Diesel***

| | |
|---|---|
| *Detail:* | The limiting values for Cetane (minimum 51), Distillation -- 95-%-Point (maximum 360 $^o$C) and Sulphur (maximum for Diesel fuel < 50 ppm sulphur) were exceeded by one or more samples of Diesel. |
| *Statistical significance:* | The tolerance limit for statistical significance for Cetane and Distillation -- 95-%-Point were not exceeded for these samples, which therefore complied with the Directive.<br>The tolerance limit for statistical significance for Sulphur content was exceeded by two samples with sulphur content of 123.5 mg/kg and 122.8 mg/kg and were therefore non-compliant with the Directive. |
| *Member State's notes:* | The Sulphur samples that were non-compliant with the Directive resulted in prosecution. |

## 6.3 Temporal trends

Figure 6.2 to Figure 6.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales.

**Figure 6.2: Temporal trends in national sales of petrol and diesel (million litres)**

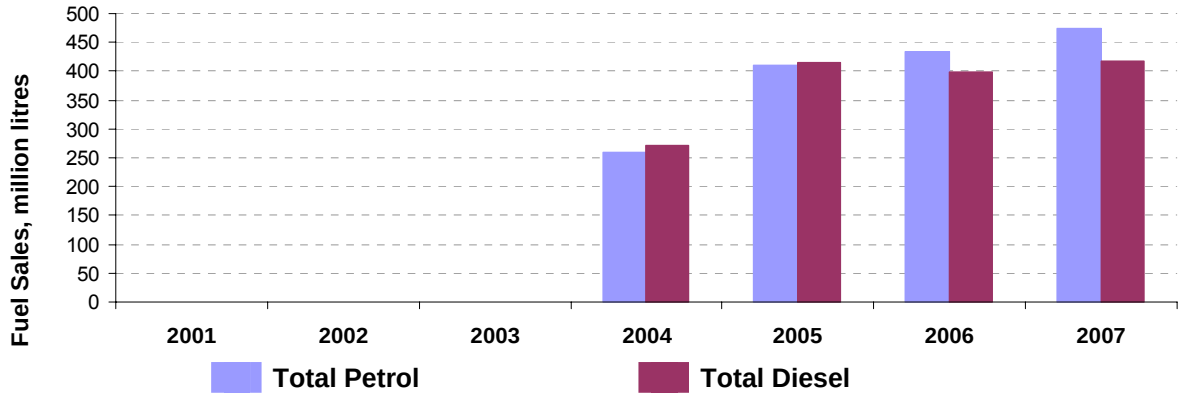



**Figure 6.3: Temporal trends in national sales of low sulphur petrol (%)**

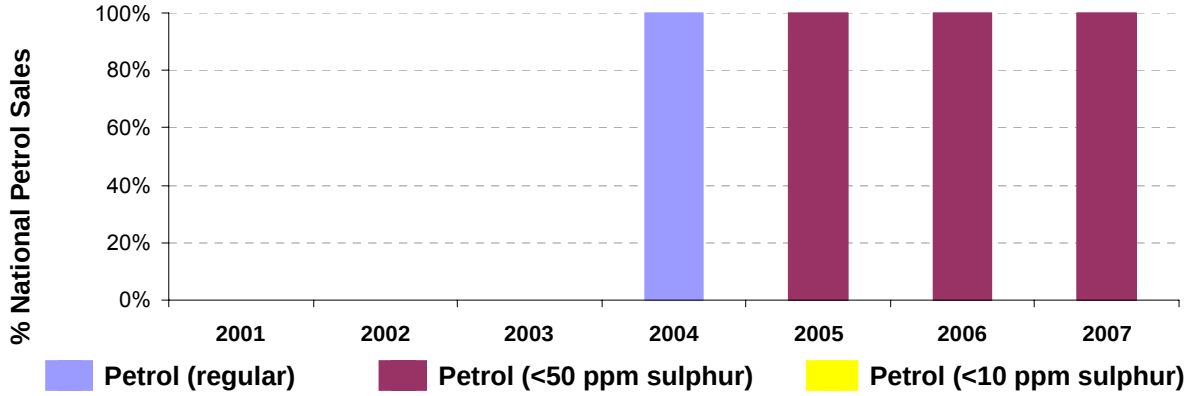



**Figure 6.4: Temporal trends in national sales of low sulphur diesel (%)**

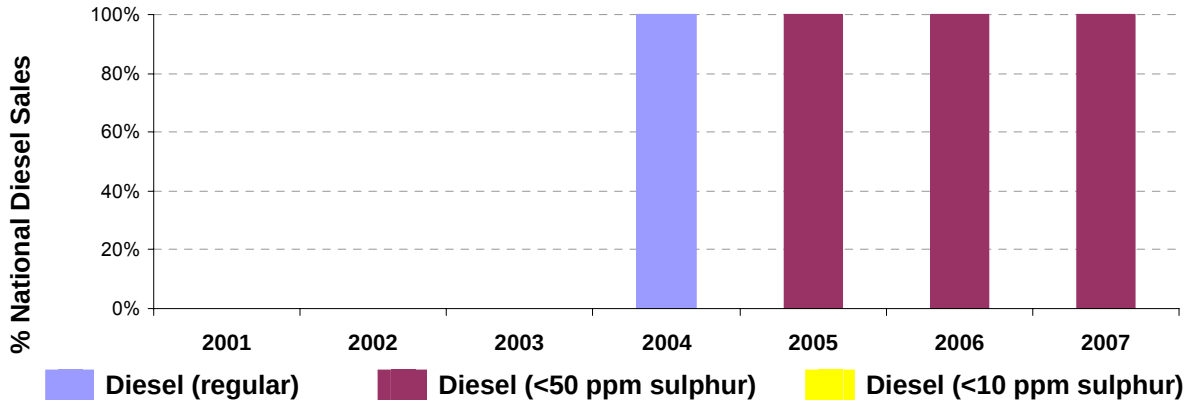
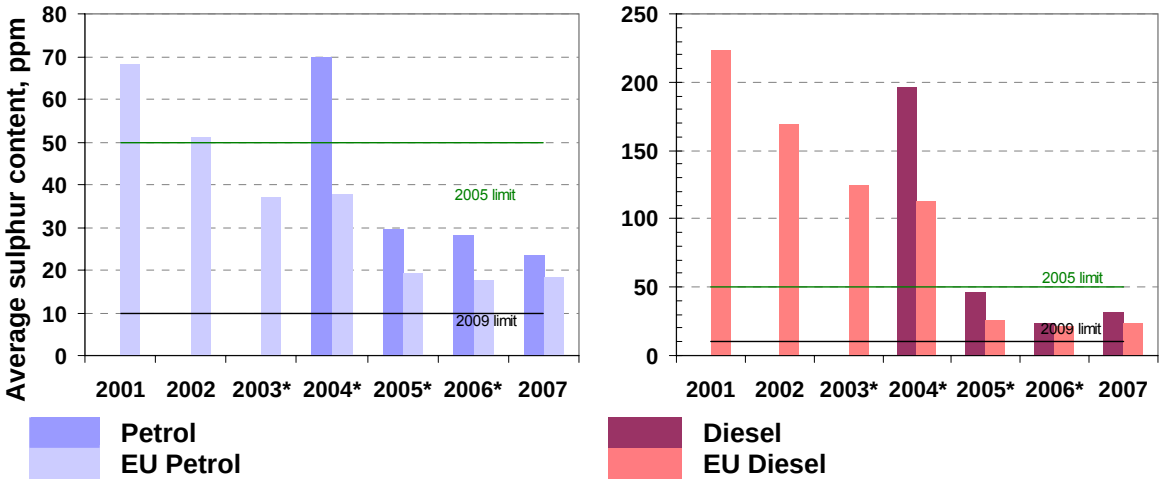



Figure 6.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Average sulphur content has reduced since 2004, with the introduction of the mandatory limit of <50ppm since the start of 2005. Sulphur levels remain above EU averages.

**Figure 6.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 6.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Sulphur free fuels are not available as required under the Directive.<br>• One fuel parameter (the iso-butyl concentration) was not analysed in this year's monitoring because it could not be determined with Cyprus' existing apparatus;<br>• The number of samples taken for the two petrol fuel grades would not be sufficient for Fuel Quality Monitoring System C (which requires at least 50 samples to be analysed per summer & winter period); however, the number of samples analysed has increased since 2006. |

# 7 Czech Republic

## 7.1 Fuel Availability 2007

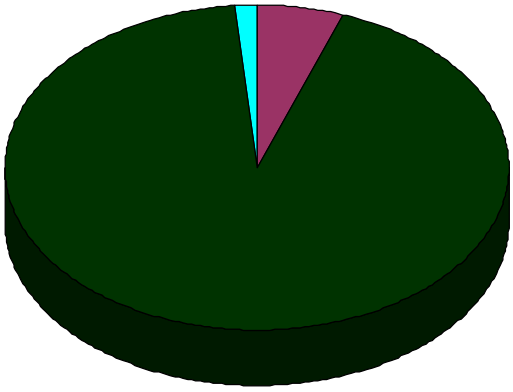
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

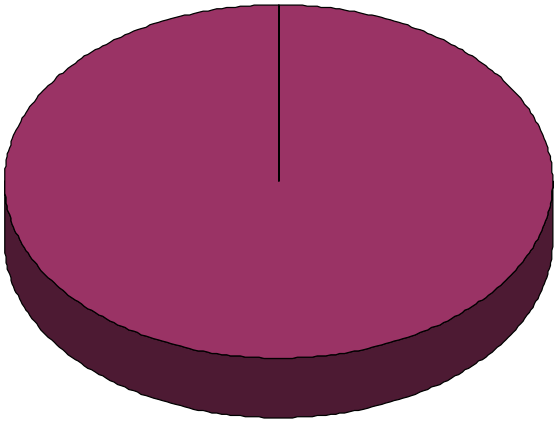
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 2 | RON 91 | <50 ppm | Normal BA-91 and Special BA-91 | 2 |
| 3 | RON 91 | <10 ppm | BA - 91 Speciál (10 ppm) | 3 |
| 5 | RON 95 | <50 ppm | Super BA-95 | 5 |
| 6 | RON 95 | <10 ppm | BA - 95 Super (50 ppm S) | 6 |
| 12 | RON 98 | <10 ppm | Super Plus BA-98 | 12 |
| 14 | Diesel | <50 ppm | Motorová nafta (50 ppm S) | 14 |
| 15 | Diesel | <10 ppm | Motorová nafta (10 ppm S) | 15 |

### 7.1.1 Sales

**Figure 7.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 5.5% | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 93.2% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 1.4% | | | |

Figure 7.1 only shows sales figures for fuels sold in the Czech Republic in 2007. Low sulphur and sulphur free fuels are available in the Czech Republic, although sales figures do not give the sulphur split for RON 91 and RON 95 fuels. Sulphur free (<10 ppm sulphur) RON 98 sales figures, are however available. RON 95 fuel sales have increased proportionately from 90.4% in 2006 to 93.2% of sales in 2007, with a corresponding reduction in sales of RON 91 fuels.

### 7.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur free fuels are produced in the Czech Republic and supplied to the market by relatively few suppliers of automotive fuels. As a result, fuel dispensers with these fuels are not, in most cases, separately labelled.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes, fuel grades have been analysed according to the 50ppm and 10ppm sulphur split, however no sales figures are available for sulphur free fuels.

***Average sulphur content of all petrol and diesel sold:*** Table 7.1 shows the average content of fuel sold in relation to the EU27 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 7.1: Annual trend in average sulphur content in petrol and diesel fuels**

| CZ | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 132 | 27 | 26 | 34 | 18 |
| *Diesel* | | | | 238 | 32 | 20 | 7 | 23 |

## 7.2 Fuel Quality Monitoring 2007

### 7.2.1 Description of system

***Responsible organisation(s):*** The Czech Ministry of Industry and Trade (MIT) is responsible for issuing directives guidlines (directive 98/70/EC, 2000/71/EC, 2003/17/EC, part of 2003/30/EC and Decision 2002/159/EC) regarding the quality of automotive fuels and is responsible for submitting reports on the FQMS for fuels (petrol and diesel) sold in the Czech Republic.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** Samples were taken throughout the year in both summer and winter periods.

***Specification of test methods:*** Fuel quality is monitored on the basis of MIT Decree no. 229/2004 Coll., laying down the requirements for fuels of road vehicles and for fuel quality

monitoring, which has been harmonized with EU legislation and is compliance with European quality standards for petrol and diesel (EN 228 and EN 590), test standards, sampling standards and the FQMS.

***Collection of sales data:*** Sampling in compliance with EN 14275:2003 is carried out by the Czech trade Inspection (CTI) primarily at Refuelling Stations (RS).

***Other details:*** In order to establish the quality of the Czech Republic's fuel distribution market a large number of samples are taken and analysed. In addition to the parameters required under the FQMS to conform to environmental specifications additional characteristics not required by the Directive are alsomonitored for consumer protection.

### 7.2.2 Sampling and reporting

The Czech Republic was essentially compliant with the sampling and reporting requirements in 2007. Table 7.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 7.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement (1) | | | |
| 2 | RON 91 <50ppm S | 2 | 5.5% | 21 | 78 | 6 | Yes | All of 18 | |
| 3 | RON 91 <10ppm S | 3 | 0.0% | 1 | 7 | | Yes | All of 18 | (1) |
| 5 | RON 95 <50 ppm S | 5 | 93.2% | 123 | 477 | 100 | Yes | All of 18 | |
| 6 | RON 95 <10 ppm S | 6 | 0.0% | 143 | 137 | | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 1.4% | 7 | 14 | 2 | Yes | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **295** | **713** | **108** | **Yes** | **All of 18** | |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 282 | 263 | 100 | Yes | All of 5 | |
| 15 | Diesel <10 ppm S | 15 | 0.0% | 285 | 414 | | Yes | All of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **282** | **263** | **100** | **Yes** | **All of 5** | |

**Notes:** S = Summer; W = Winter
(1) No sales data has been provided for fuel grades including sulphur split, however analysis has been carried out for low sulphur and no sulphur fuels within separate grades.

### 7.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 91 Petrol < 50 ppm***

*Detail:* The limiting value for Aromatics of 35% was exceeded by at least one showing a value of 36.6% (v/v). The summer vapour pressure limiting value (of max 60.0 kPa) was exceeded by 3 samples giving values between 69.2 and 72 kPa.

At least one sample was below the limit value for distillation at 150 $^{o}$C (minimum 75 %v/v) with a value of 72.5 % v/v. The limiting value for the maximum sulphur content for low sulphur fuels (50 mg/kg) was exceeded by at least one sample, giving a value of 55.7 mg/kg.

*Statistical significance:* The tolerance limits for statistical significance for Aromatics, Distillation at 150 and Sulphur content are 37.2%v/v (minimum) 72.5 kPa and 55.7 mg/kg respectively so the samples were

compliant with the Directive.

The Tolerance Limits for Summer Vapour Pressure (61.8 kPa) was exceeded by 3 samples with values from 69.2 to 72 kPa and so were non-compliant with the Directive.

*Member State's notes:* Service station outlets where non-compliant fuels have been detected are monitored more frequently by The Czech Ministry of Industry and Trade.

***RON 91 Petrol < 10 ppm***

*Detail:* The summer vapour pressure values (of max 60.0 kPa) was exceeded by at least 1 sample with a value of 61 kPa.

*Statistical significance:* The tolerance limit for statistical significance for the vapour pressure parameter test method is 61.8 kPa and so the samples is compliant with the Directive.

*Member State's notes:* Service station outlets where non-compliant fuels have been detected are monitored more frequently by The Czech Ministry of Industry and Trade.

***Additional Notes:*** At least one sulphur content sample exceeded the limiting value for sulphur free fuels with a value of 11 mg/kg. However, the sample is compliant with the Directive tolerance limit of 11.6 mg/kg.

***RON 95 Petrol < 50 ppm***

*Detail:* The RON, MON, summer vapour pressure, distillation at 100°C and 150 °C, aromatics, benzene, oxygen content, methanol and oxygen content limit values (of min. 95, min. 85, 60.0 kPa, min. 46 %v/v, min 75 %v/v, 35.0 %v/v, 1.0 %v/v, 2.7 %m/m, 3.0 %v/v and 50 mg/kg) were all exceeded by at least one fuel sample.

*Statistical significance:* The tolerance limits for statistical significance for Oxygen content (2.9 %m/m) and methanol (3.2 %v/v) were not exceeded by the samples, which gave values of 2.9 %m/m and 3.1 % v/v respectively.

8 samples exceeded the minimum tolerance limit for RON (94.6), giving values between 87.5 and 94.5, a further 8 samples exceeded the minimum tolerance limit for MON (84.5), giving values between 79.8 and 84.3 and so were non-compliant with the Directive.

2 samples exceeded the maximum summer vapour pressure if 61.8 kPa, giving values of 72.7 and 70.9 kPa, Distillation at 100 and 150 tolerance limits (43.6 %v/v and 72.6 %v/v) were exceeded by 1 and 3 samples respectively, giving values of 38 % v/v and 71.5%v/v, 72%v/v and 73%v/v and so were non-copmpliant with the Directive.

Aromatics and Benzene Tolerance Limits 37.2 % v/v and 1.1 % v/v were exceeded by 2 samples each, with values of 41.8 % v/v, 65.6 % v/v, 9 % v/v and 18.9 % v/v respectively.

The tolerance limit for low sulphur petrol tested using method EN ISO 20846 is 55.7 and therefore 2 samples were non-compliant with the Directive, giving values of 409 mg/kg and 449 mg/kg.

*Member State's notes:* Service station outlets where non-compliant fuels have been detected are monitored more frequently by The Czech Ministry of Industry and Trade.

***RON 95 Petrol <10 ppm***

*Detail:* The RON, MON, summer vapour pressure, distillation at 100°C and 150 °C, (of min. 95, min. 85, 60.0 kPa, min. 46 %v/v and min 75 %v/v) were exceeded by one or more samples.

*Statistical significance:* 4 samples exceeded the minimum tolerance limit for RON (94.6), giving values between 91 and 94.2, a further 4 samples exceeded the minimum tolerance limit for MON (84.5), giving values between 81.9 and 84.3 and so were non-compliant with the Directive.

1 sample exceeded the maximum summer vapour pressure if 61.8 kPa, giving a value of 69.9 kPa.

Distillation at 100 and 150 tolerance limits (43.6 %v/v and 72.6 %v/v) were exceeded by samples giving values of 41.2 % v/v and 67.5%v/v respectively.

All of the samples detailed above exceeded tolerance limits and so were non-compliant with the Directive.

*Member State's notes:* Service station outlets where non-compliant fuels have been detected are monitored more frequently by The Czech Ministry of Industry and Trade.

***RON 98***

*Detail:* The limiting value for Aromatics (35 %v/v) and Ethers (15 %v/v) were exceeded by samples giving maximum values of 36.3%v/v and 15.5%v/v respectively.

*Statistical significance:* The tolerance limits for statistical significance for these parameter test methods are 37.2%v/v and 15.6%v/v and so these samples complied with Directive limits.

*Member State's notes:* -

***Diesel < 50 ppm***

*Detail:* The distillation 95 % point and sulphur content limit values (of max. 845 kg/$m^3$, 360°C and 50 ppm) were exceeded by 3 and 4 samples respectively.

*Statistical significance:* Samples values of 367$^0$C, 371$^0$C and 380.2$^0$C (Distillation) and Sulphur contents of 93 mg/kg, 101 mg/kg, 141 mg/kg and 765 mg/kg exceeded tolerance limits for the parameters (365.9$^0$C and 54 mg/kg) and so were non-compliant with the Directive.

*Member State's notes:* -

***Diesel < 10 ppm***

*Detail:* Distillation 95 % point limiting values of 360$^0$C was axceeded by at least one samples, with a maximum value of 364.5$^0$C.

*Statistical significance:* The tolerance limits for statistical significance for Distillation 95 %

point is 365.9$^0$C and so the sample was compliant with the Directive.

*Member State's notes:* -

***Additional Notes:*** At least one sulphur content sample exceeded the limiting value for sulphur free diesel fuels with a value of 11.3 mg/kg. However, the sample is not compliant with the Directive tolerance limit for sulphur free diesel fuels of 11.3 mg/kg, although the sample is well within the overall Directive limit of 61.8 mg/kg.

## 7.3 Temporal trends

Figure 7.2 to Figure 7.5 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Reporting year 2005 was the first full year of reporting, although the Czech Republic also supplied full sales data for 2004. On the whole, both petrol and diesel sales have continued to decrease compared to 2005 reporting figures. Sales data is available for RON 98 sulphur free fuel where previously sales data has included only low sulphur (<50ppm) fuels.

**Figure 7.2: Temporal trends in national sales of petrol and diesel (million litres)**

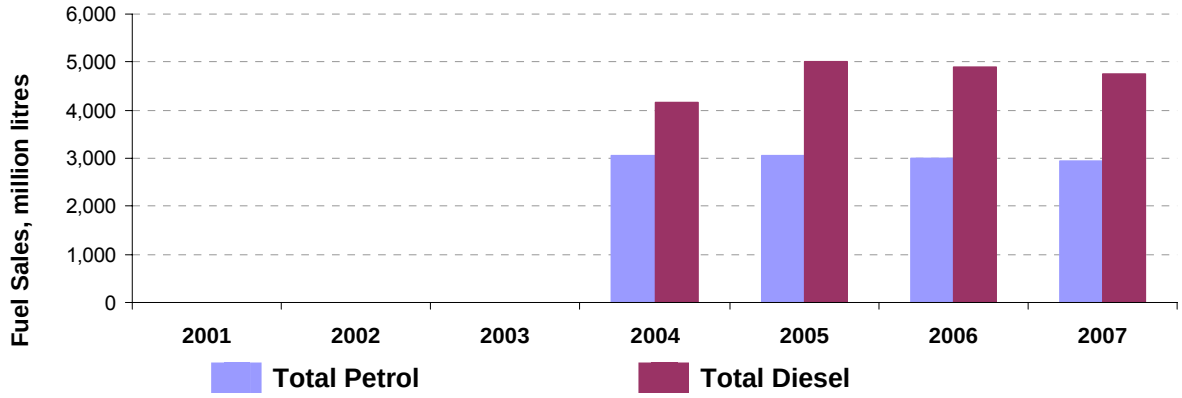



**Figure 7.3: Temporal trends in national sales of low sulphur petrol (%)**

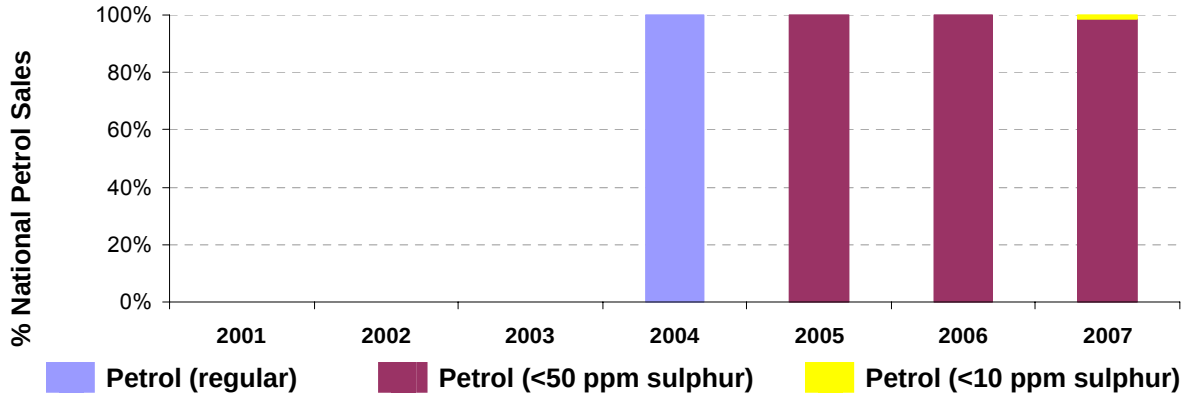


**Figure 7.4: Temporal trends in national sales of low sulphur diesel (%)**

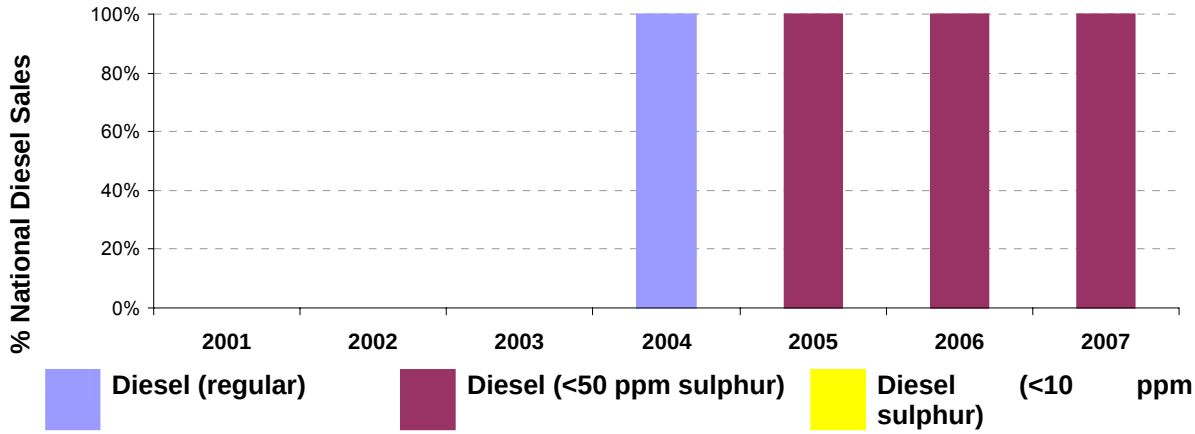
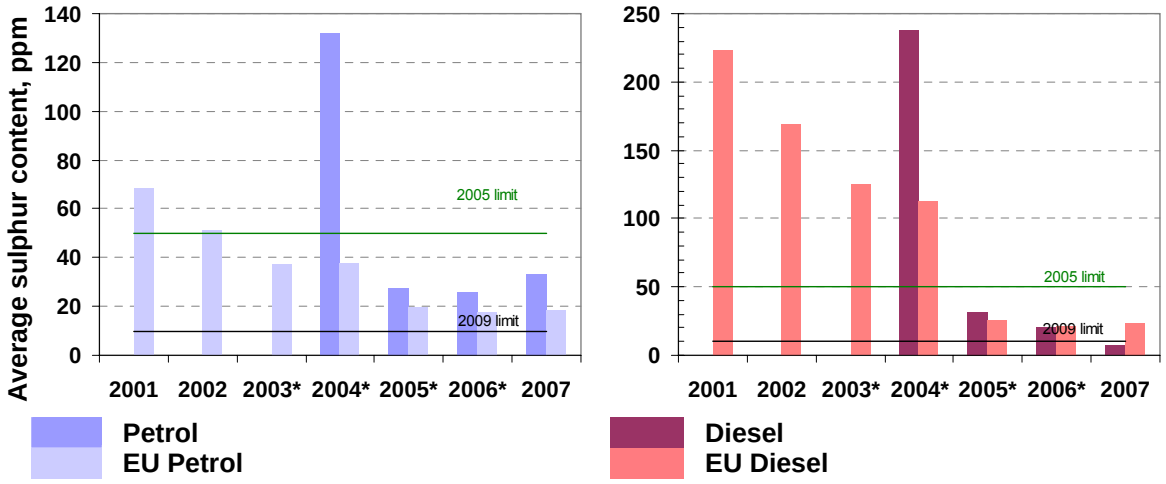



Figure 7.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Average sulphur content has reduced since 2004, with the introduction of the mandatory limit of <50ppm since the start of 2005. The average sulphur content of petrol has reduced significantly since 2004 and since then remained below the 2005 limit but above the EU average. Diesel sulphur levels are below the EU average and have reduced more than half since 2006. The average sulphur content in diesel fuel was well below the 2005 limit and the EU average and also below the forthcoming 2009 limit.

**Figure 7.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006; and includes new EU10 Member States from 2004.

## 7.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
| --- |
| • The Czech Republic has used FQMS Statistical Model C. Given the size of the country it is recommended that the Czech Republic investigate whether Models A or B may be more appropriate.<br>• Sampling was conducted 'primarily at refuelling stations'. The Czech Republic should ideally indicate the number of samples taken at refuelling stations to demonstrate compliance with EN14274.<br>• Sulphur-free fuels were supplied to market but were not separately marketed at refuelling stations in 2007. As a result, sales figures for sulphur-free fuels are not available for the 2007 reporting period. |

# 8 Denmark

## 8.1 Fuel Availability 2007

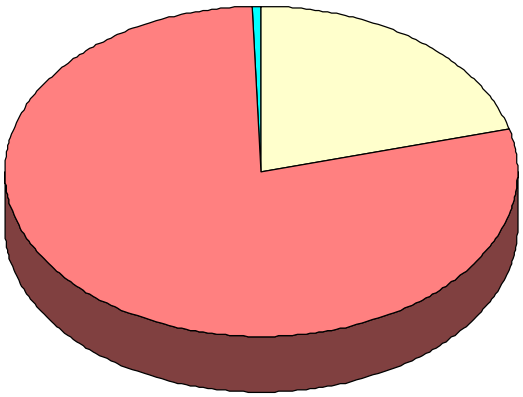
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

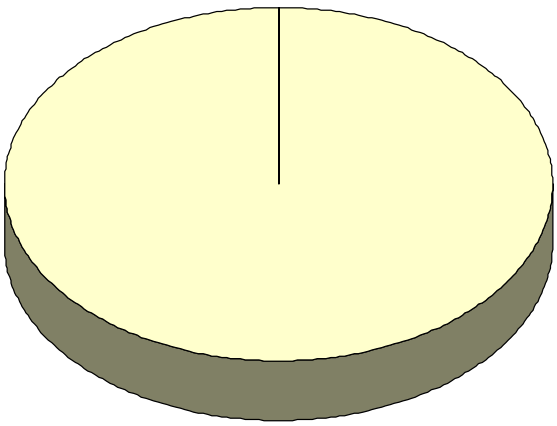
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 3 | RON 91 | <10 ppm | RON 92 | 3 |
| 6 | RON 95 | <10 ppm | RON 95 | 6 |
| 12 | RON 98 | <10 ppm | RON 98 | 12 |
| 15 | Diesel | <10 ppm | Sulphur-free diesel | 15 |

### 8.1.1 Sales

**Figure 8.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 20.8% | 15 | Diesel (<10 ppm sulphur) | 100.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 78.7% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 0.4% | | | |

Figure 8.1 above shows that all petrol and diesel fuels sold in Denmark in 2007 were sulphur-free (<10 ppm), as for the previous two years. The majority of petrol sales (78.7%)

were RON 95 grades (a fractional increase of 0.2% since 2006), 20.8% of sales were at the lowest RON 91 petrol fuel grade (a reduction of 0.2% since 2006), and the remainder (0.4%) was RON>98.

### 8.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** In order to promote the availability of sulphur free petrol and diesel, a tax exemption of 0.04 DKK pr. litre (approx. 0.5 Euro cents pr. litre) petrol and 0.02 DKK pr. litre (approx. 0.25 Euro cents pr litre) diesel was introduced on 1st January 2005. Due to the alternative of distributing two different qualities of petrol and diesel, the tax exemption has led to a 100% conversion to sulphur free petrol and diesel on Danish petrol stations.

The tax exemption will cease when sulphur free fuel becomes mandatory in 2009.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** N/A – 100% sulphur free fuels in Denmark.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** N/A

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since 2001 with a substantial drop from 2005 with full market conversion to <10ppm fuels, see Table 8.1.

***Additional information:*** A fiscal incentive has been in place to promote auto diesel with sulphur content below 50 ppm since June 1999, superseded in 2005 with an incentive for 10ppm fuel – this has led to a conversion to 100% sulphur free fuels.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 8.1: Annual trend in average sulphur content in petrol and diesel fuels**

| DK | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 47 | 40 | 19 | 23 | 3 | 3 | 2 | 18 |
| *Diesel* | 51 | 48 | 28 | 35 | 8 | 8 | 7 | 23 |

## 8.2 Fuel Quality Monitoring 2007

### 8.2.1 Description of system

***Responsible organisation(s):*** Danish Environmental Protection Agency, sampling and analysis by SGS Sweden (according to EN 14274 and EN 14275 specifications).

***Format of Fuel Quality Monitoring System (FQMS):*** National System, with reduced sampling compared to EN 14274 (see other details).

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions)

***Location(s) of sampling:*** Samples have been taken from all companies on the Danish market and sites are chosen randomly by the Danish Environmental Protection Agency from a list of existing filling stations. Half of the samples have been taken east of Storebaelt and

the other half west of Storebaelt; the population is nearly the same east and west of Storebaelt.

***Time/frequency of sampling:*** Half of the samples have been taken in summer (August) and the other half in winter (May and October).

***Specification of test methods:*** The test methods applied for analysis are in some cases different from the methods set out in EN 228:1999 and EN 590:1999. SGS Sweden, who performs the analysis, has declared that the methods used correspond to the ones in the directive.

***Collection of sales data:*** The sales data is supplied from the Danish Energy- and Oil association which is the industrial association for oil companies in Denmark.

***Other details***: The Danish Fuel Quality Monitoring Programme is described in the Danish Statutory Order no. 884 of 3. November 2003 which was send to the Commission in November 2003 when notifying the implementation of directive 2003/17. Compared to the procedure described in EN 14274 the number of samples is reduced. The reasoning behind the Danish programme is as follows:

- More than 99% of the fuels used for road transport in Denmark are distributed from the two Danish refineries or from terminals owned by members of the Danish Petroleum Industry Association (OFR), which have to meet the Association's Exchange specifications. These specifications are in accordance with DS/EN 228 for petrol and DS/EN 590 for diesel and the current Danish Statutory Order regarding the quality of petrol and diesel fuel.

- More than 99% of the fuels used for road transport in Denmark are delivered from terminals, which are certified in accordance with ISO 9000 or equivalent quality-management systems.

- More than 99% of the fuels used for road transport in Denmark are distributed from terminals where "Certificates of Quality" exist for every import/batch approved according to DS/EN 228 for petrol or DS/EN 590 for diesel and the current Danish Statutory Order regarding the quality of petrol and diesel.

Some of the specified parameters are only measured on a reduced number of samples. It is parameters that are estimated to have minor influence on the environment (RON, MON, oxygen and oxygenates). Also for lead a reduced number of samples are analysed. Lead has not been present in petrol in Denmark for more than 10 years.

### 8.2.2 Sampling and reporting

Denmark was essentially compliant with the sampling and reporting requirements in 2007, however the numbers of samples of all grades remain low, and in particular of RON 95 considering it comprises more than 70% of sales. Sampling numbers for RON 91 remain low given the percentage of sales the fuel grade represents. The following Table 8.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 8.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 3 | RON 91 <10ppm S | 3 | 20.8% | 4 | 6 | - | Yes | All of 18 | |
| 6 | RON 95 <10 ppm S | 6 | 78.7% | 16 | 13 | - | Yes | All of 18 | |
| 12 | RON 98 <10 ppm S | 12 | 0.4% | 1 | 1 | - | No | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **21** | **20** | **-** | **No** | **All of 18** | |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 11 | 10 | - | Yes | All of 5 | |
| **D** | **Total Diesel** | | **100%** | **11** | **10** | **-** | **Yes** | **All of 5** | |

**Notes:** S = Summer; W = Winter

### 8.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol-RON 91***

*Detail:* Limiting Values for parameters RON and MON were exceeded by at least one sample each.

*Statistical significance:* The tolerance limit for statistical significance for RON 91 fuel is a minimum of 90.6 (RON) and 80.5 (MON) and therefore the samples were compliant with the Directive.

***Petrol-RON 95***

*Detail:* At least one sample exceeded the Limiting Values for MON and Vapour Pressure (summer reporting value) with values of 84.7 and 70.8 kPa respectively.

*Statistical significance:* The tolerance limit for statistical significance for the MON (80.5) and the vapour pressure test method (71.9 kPa) were not exceeded and therefore the samples were compliant with the Directive.

***Petrol-RON 98***

All sampling reported was within the limiting value for parameters and therefore were all compliant with the Directive

***Diesel***

All sampling reported was within the limiting value for parameters and therefore compliant with the Directive.

***Additional information***: In addition to the above, there was an exceedance of the <10ppm sulphur content limit for diesel fuels marketed as sulphur-free, with sulphur content of 11.1ppm. The sample remains compliant with the Directive as it is significantly lower than the 50ppm limiting value for low sulphur grades of fuel.

## 8.3 Temporal trends

Figure 8.2 to Figure 8.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. There has been a small decrease in the sales of petrol (by 6%) but a 44% increase in the sales of diesel since 2001. The sales share of RON 91, RON 95 and RON 98 petrol has remained fairly stable. All petrol and diesel fuels marketed from 2005 onwards were sulphur-free (<10ppm).

**Figure 8.2: Temporal trends in national sales of petrol and diesel (million litres)**


**Figure 8.3: Temporal trends in national sales of low sulphur petrol (%)**

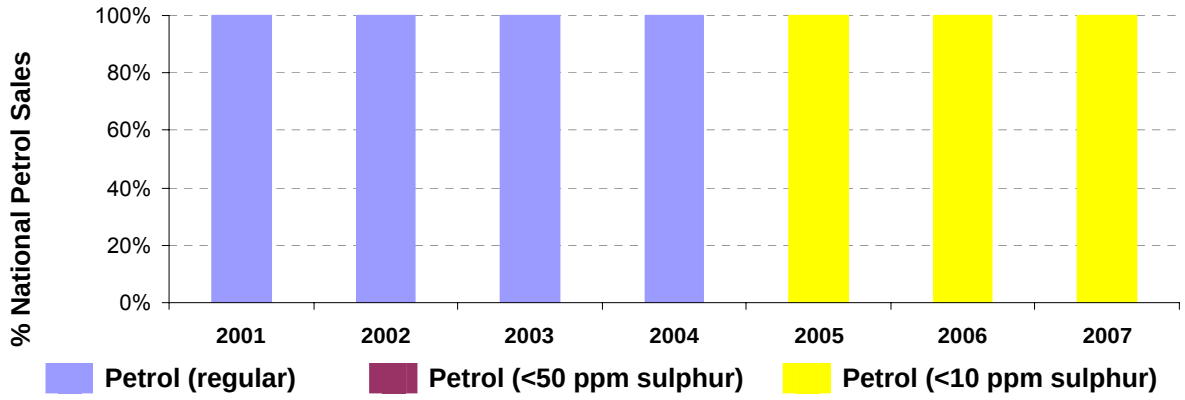



**Figure 8.4 Temporal trends in national sales of low sulphur diesel (%)**

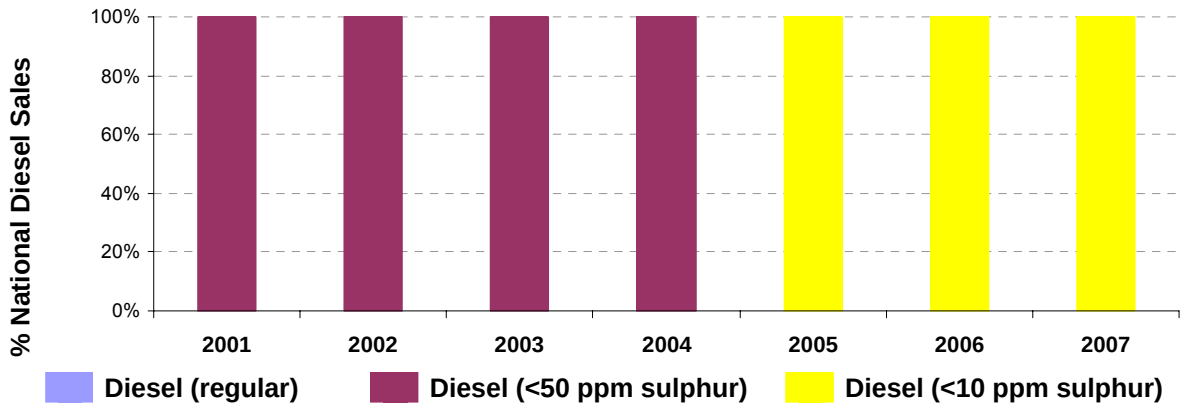
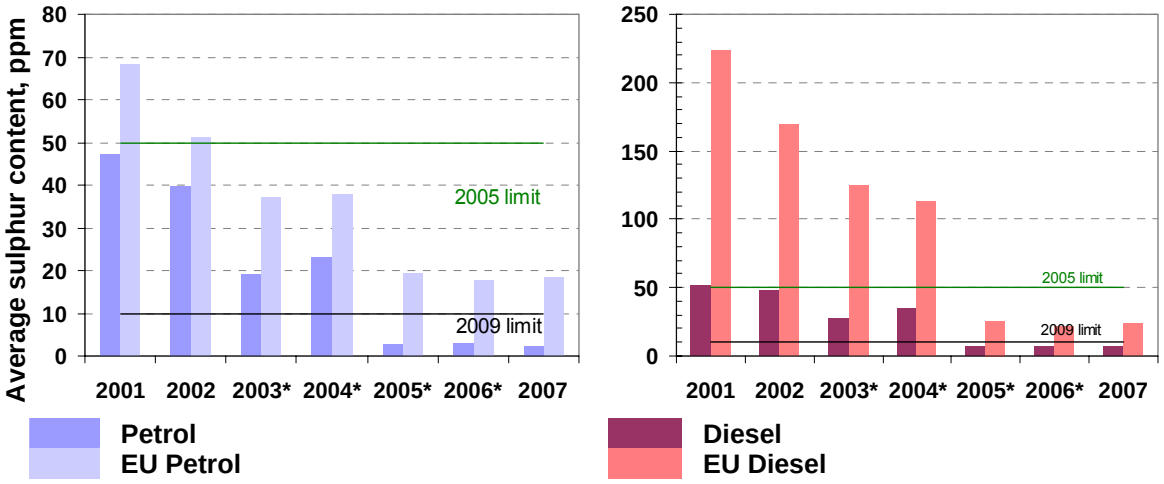


Figure 8.5 shows the trend in average sulphur content of petrol and diesel fuels in Denmark compared with the EU average (derived from sample analysis results and relative sales). The average sulphur content of both petrol and diesel fuels has decreased since 2001 with a substantial drop in 2005 with the full market conversion to <10ppm fuels. The average sulphur contents were well below the 2005 limit, the EU average and the forthcoming 2009 limit.

**Figure 8.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006, and includes new EU10 Member States from 2004.

## 8.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement[16] |
|---|
| • Although Denmark has provided a number of reasons for taking a reduced number of samples for analysis compared with the European Standard EN14274, it has not demonstrated that the national FQMS is statistically equivalent to the standard. In particular the numbers of samples of RON 95 appear low considering it comprises over 70% of sales, as do the number of samples of RON 91 petrol grades. It is recommended that a greater number of samples are taken and analysed in future years. |

[16] Danish EPA has unfortunately not had the resources to investigage the statistically equivalence of the Danish FQMS. We are however still confident that the present number of samples is sufficient to demonstrate compliance with directive 98/70. Further, a significant increase of the number of samples is a question of ressources.

# 9 Estonia

## 9.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

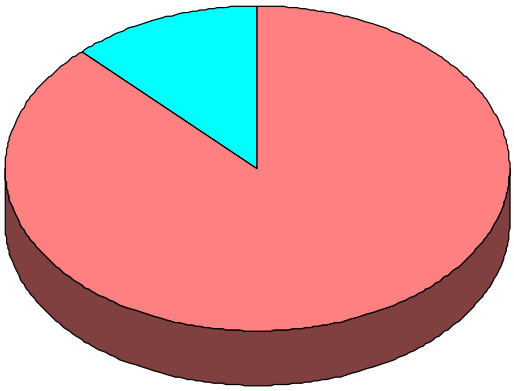
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 6 | RON 95 | <10 ppm | väävli- ja pliivaba bensiin (RON 95) | 6 |
| 12 | RON 98 | <10 ppm | väävli- ja pliivaba bensiin (RON 98) | 12 |
| 14 | Diesel | <50 ppm | diislikütus | 14 |
| 15 | Diesel | <10 ppm | väävlivaba diislikütus | 15 |

Separate results were provided for the sulphur contents of the low sulphur and sulphur free diesel grades.

### 9.1.1 Sales

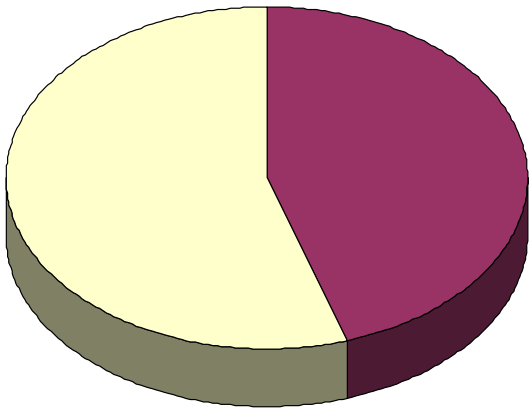
**Figure 9.1: National fuel sales volume proportions by fuel type (%)**

**Petrol Sales 2007**



| | Fuel Type | % |
|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - |
| 4 | Unleaded petrol min. RON=95 | - |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 87.9% |
| 7 | Unleaded petrol 95=<RON<98 | - |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - |
| 10 | Unleaded petrol RON>=98 | - |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 12.1% |

**Diesel Sales 2007**



| | Fuel Type | % |
|---|---|---|
| 13 | Diesel | - |
| 14 | Diesel (<50 ppm sulphur) | 45.1% |
| 15 | Diesel (<10 ppm sulphur) | 54.9% |

Figure 9.1 shows that sulphur-free fuel grades available in 2007 comprised 100% of petrol sales and 54.9% diesel sales (reduced from 70% of diesel fuel sales in 2006).

### 9.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** All petrol grades sold in Estonia 2007 were sulphur free. Due to the small size of the country the filling stations are well spread according to demand over the territory. There are no large refuelling stations or highway/motorway stations in Estonia. Diesel fuel is available at <10ppm and <50ppm.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes

**Are the sample analysis results for sulphur content of sulphur-free grades reported separately?** Yes; results analysis has been provided for both diesel fuel grades.

***Average sulphur content of all petrol and diesel sold:*** Table 9.1 shows the average content of fuel sold in relation to the EU25 average. The sulphur content has dropped substantially since 2004.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 9.1: Annual trend in average sulphur content in petrol and diesel fuels**

| EE | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 57 | 20 | 6 | 4 | 18 |
| *Diesel* | | | | 188 | 25 | 11 | 14 | 23 |

## 9.2 Fuel Quality Monitoring 2007

### 9.2.1 Description of system

***Responsible organisation(s):*** The Estonian Environmental Research Centre (EERC) manages the FQMS and reports on the results. The monitoring followed the European Standard EN 14274. The sample-taking followed the European Standard EN 14275. Analyses were done in the laboratory of EERC and the applied methods had accreditation.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions) – in terms of application of Directive limit values for vapour pressure. However, according to Estonian standard EVS-EN 228:2004 (and EVS-EN 590:2004) Annex NA p. 5.6.2 the summer period in Estonia is between 1 May - 30 September and winter period 1 December - 29 February.

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** Samples for petrol fuel grades analysis were taken 7 months of 12 and were spread across winter and summer periods. Analysis of diesel grades has been reported separately, although sampling has not been broken down by fuel grade sulphur content and/or season. From information given, samples were taken 8 months out of 12 and were spread across summer and winter periods. Sampling levels for diesel <50ppm are lower than required for FQMS EN 14274 Statistical Model C given the proportion of sales the grade represents.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** Sales data was obtained from the Estonian Tax and Customs Board.

***Other details:*** No further information provided.

### 9.2.2 Sampling and reporting

Estonia was essentially compliant with the sampling and reporting requirements in 2007. Table 9.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 9.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 6 | RON 95 <10 ppm S | 6 | 87.9% | 103 | 77 | 100 | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 12.1% | 89 | 81 | 100 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **192** | **158** | **200** | | | |
| 14 | Diesel <50 ppm S | 14 | 45.1% | 34 | 20 | 100 | Yes | All of 5 | (1) |
| 15 | Diesel <10 ppm S | 15 | 54.9% | 74 | 80 | 100 | Yes | All of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **108** | **100** | **200** | | | |
| 6 | RON 95 <10 ppm S | 6 | 87.9% | 103 | 77 | 100 | Yes | All of 18 | (1) |

**Notes:** S = Summer; W = Winter
(1) Separate Summer and winter sample analysis results given for both grades of Diesel (no FY results) and no breakdown of temporal spread of sampling for grades by season (current breakdown estimated from overall total diesel results). 15 Sulphur samples exceeded tolerance limits for <10ppm sulphur content diesel grade, however all within limits as set by the Directive - Estonia is investigating the cause.

### 9.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95***

*Detail:* The limiting values of analysis parameters RON (minimum 95), MON (minimum 85), DVPE (summer limiting value for an arctic country 70 kPa), Distillation evaporated at 150$^0$C - minimum 75 % (v/v), Aromatics - maximum 35 % (v/v) and Oxygen content maximum limiting value of 2.7 % (m/m) were exceeded by one or more samples.

*Statistical significance:* The tolerance limits for statistical significance for RON and MON (94.6 and 84.5) were exceeded by 10 (94.4, 94.3, 94.4, 94.5, 92.4, 94.5, 94.5, 94.2, 93.9, 94.0) and 2 (82.8, 84.3) samples respectively and, therefore, the samples were not compliant with the Directive.

Similarly, the vapour pressure tolerance limit (71.9 kPa) was exceeded by one sample with a value of 79.3kPa and, therefore, was not compliant with the Directive.

One sample exceeded the tolerance limit for Distillation evaporated at 150$^0$C minimum of 72.6 %(v/v) with a value of 61.3 % (v/v) and

| | |
|---|---|
| | was non-compliant with the Directive. Three samples exceeded the maximum tolerance limit of 36 % (v/v) for Aromatics with values of 36.9, 36.1 and 36.6 % (v/v). |
| *Member State's notes:* | In all cases where non-compliant samples were found, authorities were informed and an investigation was initiated by Estonia. |

***Petrol RON 98***

| | |
|---|---|
| *Detail:* | Vapour Pressure, Aromatics, oxygen content and ethers with or more than 5 carbon atoms limit values (maximum 70kPa, 35 % v/v, 2.7 % m/m and 15 % v/v respectively) were exceeded by samples. |
| *Statistical significance:* | The tolerance limits for statistical significance for all samples were not exceeded – therefore samples complied with the Directive. |
| *Member State's notes:* | Authorities were informed and an investigation was initiated of all non-compliant samples. |

***Additional information:*** In addition to the above non-compliances with the Directive were exceedances of the <10ppm sulphur content limit for petrol fuels marketed as sulphur-free, with a sulphur content of respectively 22.7ppm and 20.2ppm for RON 95 fuel grade. There was also one exceedance of the <10ppm sulphur content limit for RON 98 with a sulphur content of 18.2ppm. All sulphur content, was however within the Directive limits of 50ppm and so were compliant with the Directive.

***Diesel <10ppm***

| | |
|---|---|
| *Detail:* | Cetane limit value (minimum 51) was exceeded by 2 samples with values of 50 and 50.1. |
| *Statistical significance:* | The tolerance limits for statistical significance for cetane (48.5) was not exceeded and therefore samples were compliant with the Directive. |

***Diesel <50ppm***

| | |
|---|---|
| *Detail:* | Cetane number limit value (minimum 51) was exceeded by 2 samples with a value of 50.1 and 50.7. |
| *Statistical significance:* | The tolerance limits for statistical significance for cetane (48.5) was not exceeded and the sample was therefore compliant with the Directive. |

***Additional information:*** In addition to the above non-compliances with the Directive were exceedances of the <10ppm sulphur content limit for diesel fuel marketed as sulphur-free. 15 samples exceeded the sulphur content for sulphur free diesel with values of 26.0, 27.8, 16.1, 26.2, 14.3, 30.2, 23.0, 22.3, 29.8, 19.3, 33.4, 12.8, 24.3, 16.5 and 40.0ppm. The samples are within Directive limits, however Estonia is investigating the reasons for higher sulphur contents in some samples for this diesel grade.

## 9.3 Temporal trends

Figure 9.2 to Figure 9.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Since the first year of reporting for the new EU Member States in 2004, sales of both petrol and diesel have fluctuated in Estonia. Since 2004, 100% of the

petrol fuel sales have become sulphur-free; Sulphur free diesel fuel sales have decreased significantly from 70% total diesel sales (2006) to 54.9% of total diesel fuel sales in 2007. The reason for the decrease in sulphur free diesel sales in unclear. This trend is confirmed from the sampling and analysis results shown in Figure 9.4.

**Figure 9.2: Temporal trends in national sales of petrol and diesel (million litres)**

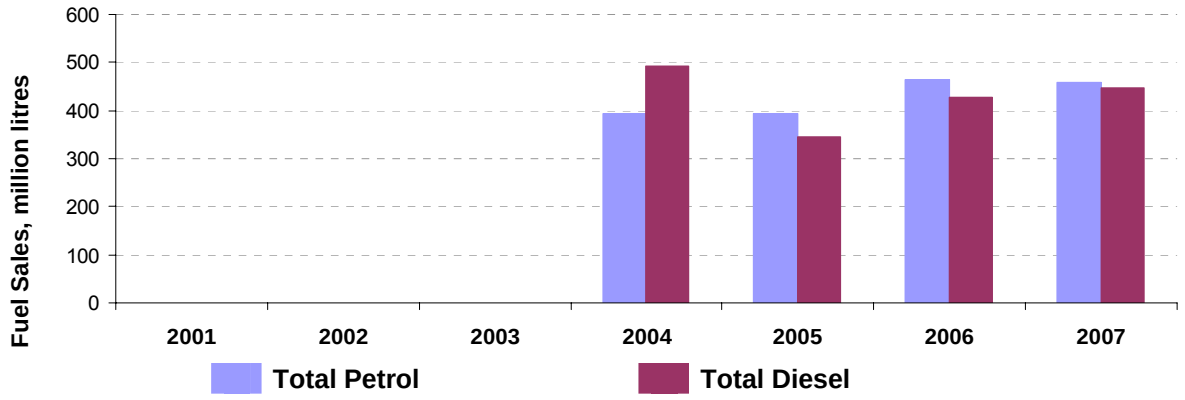



**Figure 9.3: Temporal trends in national sales of low sulphur petrol (%)**

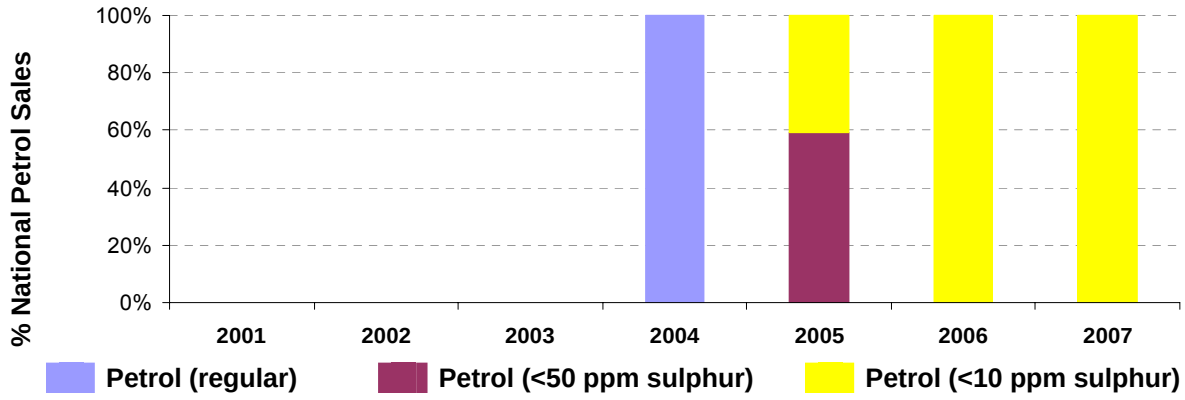



**Figure 9.4: Temporal trends in national sales of low sulphur diesel (%)**

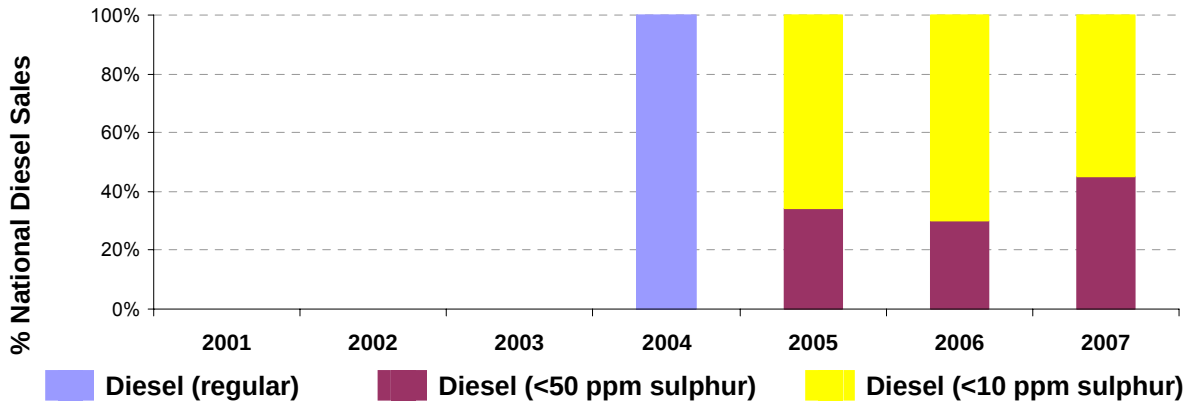
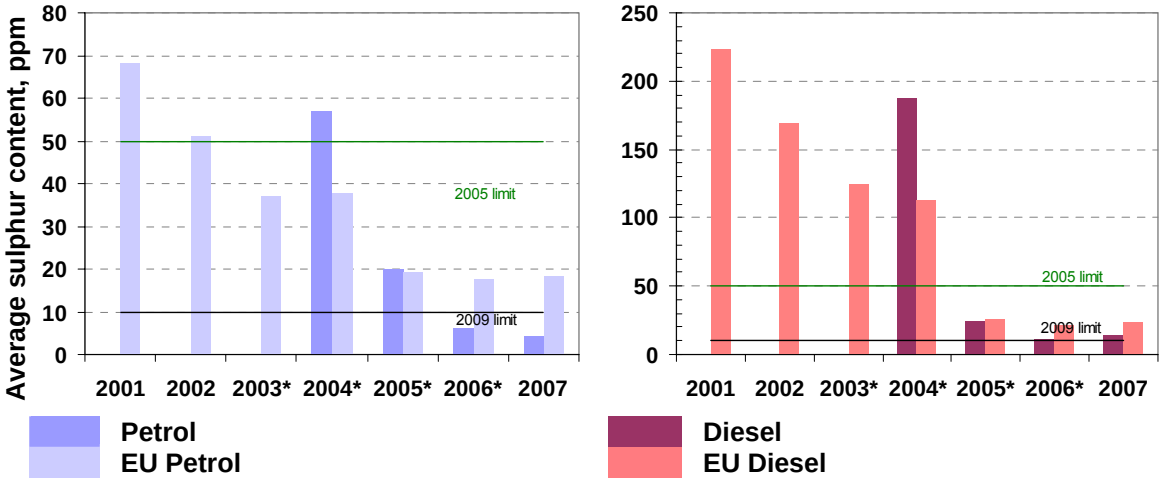



Figure 8.5 shows the trend in the average sulphur content of petrol and diesel fuels in Estonia compared with the EU average (derived from sample analysis results and relative sales). The average sulphur content of both petrol and diesel fuels has decreased since 2004 with a substantial drop in 2005 and with petrol fuel market conversion to <10ppm fuels in 2006. The average sulphur content of both fuels was well below the 2005 limit and EU average. Additionally, the sulphur content of petrol fuel was below the forthcoming 2009 limit.

**Figure 9.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 9.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Estonia is essentially compliant with reporting requirements, although a breakdown of the full year sampling results was provided for low sulphur and sulphur free diesel grades separately. Sampling numbers have been reported combined only.<br>• There were 17 non-compliances for low sulphur and sulphur free petrol fuel grades. |

# 10 Finland

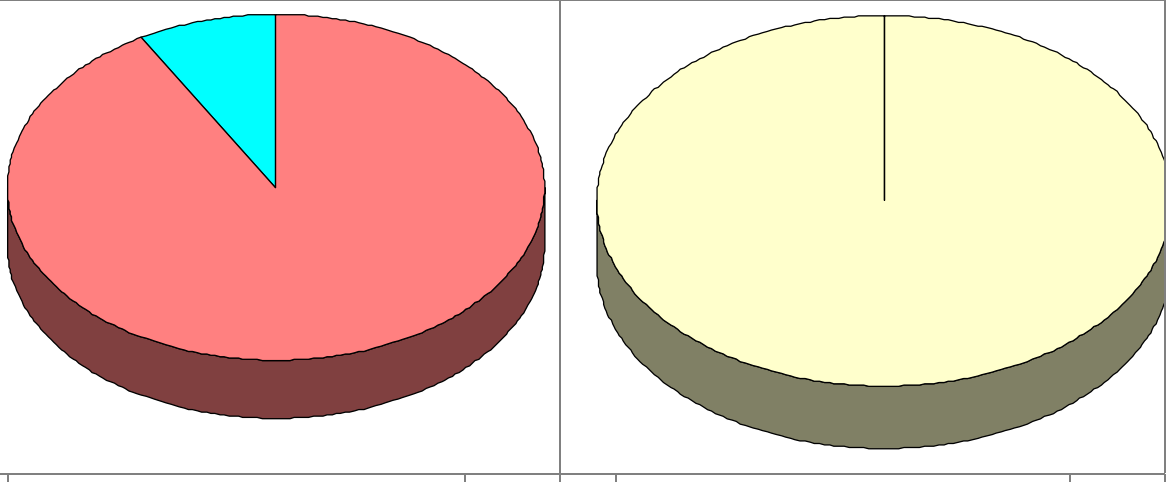
## 10.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 6 | RON 95 | <10 ppm | Bensin 95 | 6 |
| 12 | RON 98 | <10 ppm | Bensin 98 | 12 |
| 15 | Diesel | <10 ppm | Diesel | 15 |

### 10.1.1 Sales

**Figure 10.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 100.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 91.6% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 8.4% | | | |

Figure 10.1 shows that all petrol and diesel fuels sold in Finland in 2007 were sulphur-free (<10 ppm). Of petrol sales, 91.6% were of RON 95 classification (91.1% in 2006), with the remainder being of RON>98.

### 10.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** In order to have fiscal incentive for suppliers to move sulphur free fuels the excise duty of fuels were changed. Sulphur free (max. 10 mg/kg) petrol and diesel fuels have had lower duty than others from the 1st of September 2004. Due to the change in excise duty, fuel suppliers have switched to the sulphur free qualities voluntarily and from that date all petrol and diesel on the market has been sulphur-free. Mandatory EU legislation that came into force on the 1st January 2005 had – in fact – no further effect on the sulphur levels. The sulphur content of samples taken in all regions were below 10 mg/kg in 2007. The mean value of sulphur content of these samples was 6.3 mg/kg for diesel, 7.6 mg/kg for RON 95 petrol and 6.4 mg/kg for RON 98 petrol.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** All fuel sold is sulphur-free. Sulphur-free qualities have to be marked at the point of sale in Finland.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Only sulphur-free fuels are sold. Separate reporting is not necessary.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since 2001, see Table 10.1. The sulphur content of samples taken in all regions was below 10 ppm in 2007.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 10.1: Annual trend in average sulphur content in petrol and diesel fuels**

| **FI** | **Average Sulphur Content, ppm** | | | | | | | **EU27** |
|---|---|---|---|---|---|---|---|---|
| **Fuel/Year** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2007** |
| ***Petrol*** | 84 | 53 | 23 | 11 | 8 | 7 | 7 | 18 |
| ***Diesel*** | 34 | 24 | 14 | 7 | 6 | 7 | 6 | 23 |

## 10.2 Fuel Quality Monitoring 2007

### 10.2.1 Description of system

***Responsible organisation(s):*** The supervision of the quality of fuel is based on the Environmental Protection Act (86/2000), the Government Decree on the quality requirements for petrol and diesel fuel (1271/2000), it's amendments (1265/2002 and 767/2003) and an agreement between the Ministry of the Environment and Finnish Customs (38/481/2001).

According to the agreement, Finnish Customs prepares a yearly sampling plan, which is to be approved by the Ministry of the Environment. Finnish Customs is in charge of the practical realization of the supervision. The Customs' national district organization takes liquid fuel samples according to the sampling plan, and samples are analysed at the Customs Laboratory.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274:2004 Statistical Model A, with three macro regions.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions)

***Location(s) of sampling:*** Samples were taken in retail sites with the exception that during the year 2007 all octane and cetane number analysis were done from the samples taken from the fuel refineries and terminals (47 petrol and 68 diesel fuel samples). These supply samples were taken in all macro regions and at different times.

***Time/frequency of sampling:*** Each month throughout the year.

***Specification of test methods:*** Except for the lead method, all methods of analysis used (including those subcontracted) were reference methods according to the standards EN 228:2004 and EN 590:2004. The lead method used by the laboratory is a screening method. The sensitivity of the method used, is much better than the limit indicated in the quality requirements. For octane and cetane numbers, subcontractors whose competence was confirmed were used for sample testing.

***Collection of sales data:*** National sales data were taken from the statistics compiled by the Finnish Oil and Gas Federation.

***Other details:*** The sampling aims to comply, when applicable, with the requirements of standard EN 14275:2004. The sampling was done by trained personnel. One litre metal containers and five litre plastic containers approved for this purpose were used as sampling containers. Sampling was done in the whole country according to the sampling plan following the guidelines of a standard EN 14274:2004 model A. The country was divided to 3 macro-regions with about the same sales volume and variability factor. Samples were taken in retail sites with the exception that during the year 2006 all octane and cetane number analysis were done from the samples taken from the fuel refineries and terminals (47 petrol and 68 diesel fuel samples). These supply samples were taken in all macro regions and in different time. From the supply, altogether 20 petrol and 20 diesel samples were taken from macro region 1. The corresponding figures for macro region 2 are 16 and 24. For macro region 3 the figures are 11 and 24.

### 10.2.2 Sampling and reporting

The Customs laboratory in Finland is responsible for reported data and was mostly compliant with the sampling and reporting requirements in 2007. Samples were taken at retail sites according to EN14275 Model A requirements (minimum of 50 samples for each fuel grade in each summer and winter period). Additional samples were taken from refineries and terminals and used for octane and Cetane analysis, which were not routinely performed for retail site samples. The following Table 10.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 10.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 6 | RON 95 <10 ppm S | 6 | 91.6% | 59 | 75 | 100 | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 8.4% | 53 | 71 | 9 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **112** | **146** | **109** | **Yes** | **All of 18** | **(1)** |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 60 | 124 | 100 | Yes | All of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **60** | **124** | **100** | **Yes** | **All of 5** | **(2)** |

**Notes:** S = Summer; W = Winter
(1) Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value
(2) Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value

### 10.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol-RON 95***

| | |
|---|---|
| *Detail:* | The minimum value of 84.7 MON was below the minimum limit value of 85 MON. One or more aromatics samples exceeded the limiting value of 35% (v/v) with a reported maximum of 35.8% (v/v). |
| *Statistical significance:* | The tolerance limits for MON (84.5) and Aromatics (37.2 % v/v) were not exceeded and therefore these samples were compliant with the Directive. |

***Petrol-RON 98***

| | |
|---|---|
| *Detail:* | One or more samples exceeded the minimum limiting value for distillation (evaporated at 150oC) of 75% (v/v) with a value of 74.7% (v/v). One or more samples also exceeded the maximum limit value for aromatics (35.0 %v/v), with 31 %(v/v). |
| *Statistical significance:* | All samples were within the tolerance limits and so were compliant with the Directive. |
| *Member State's notes:* | The highest aromatics content 35.1 % (v/v) is above the maximum limiting value 35.0 % (v/v) but within the maximum tolerance limit 37.2 % (v/v). The lowest distillation value 74.7 % (v/v) is below the minimum limiting value 75.0 % (v/v) but within the minimum tolerance limit 72.6 % (v/v). |

***Diesel***

| | |
|---|---|
| *Detail:* | For Cetane, one sample exceeded the minimum limiting value of 51 with results showing 45.9. |
| *Statistical significance:* | One sample with a cetane number of 45.9 was outside the minimum tolerance limit of 48.5 and thus was not compliant with the Directive. |
| *Member State's notes:* | Samples for cetane analysis were taken from refineries/terminals. According to the owner of the product the fuel sample concerned has been mixed with other diesel oils in order to raise the cetane number and to meet the quality criteria in the final product. This procedure is in line with Article 87 of the Environmental Protection Law (2000/86). |

***Additional information***:
Of the samples of RON 95 petrol, one sample exceeded the maximum sulphur content of 10 mg/kg limiting value and was non-compliant with the Directive. The sample shows a sulphur content of 14.2 mg/kg, which exceeds the tolerance limit of 11.6 mg/kg. The petrol concerned has been contaminated with sulphur-rich gas oil when filling the storage tanks. A written notice has been delivered to the owner of the product. Further enforcement actions were not deemsed necessary.

Of the diesel samples tested by Finland, six samples exceeded the maximum sulphur content of 10 mg/kg limiting value and out of these four sulphur contents were above the maximum tolerance limit, in three cases the diesel concerned (11,7, 11,9 and 13,7 mg/kg)

has been contaminated with sulphur-rich gas oil when filling the storage tanks. In one case it was confirmed by laboratory analysis that the diesel concerned (48,2 mg/kg) has been contaminated or mixed with sulphur-rich heating oil containing markers. A written notice has been delivered to the owner of the product by the member state. The fuel was blended with sulphur-free diesel. Further enforcement actions were not deemed to be necessary.

## 10.3 Temporal trends

Figure 10.2 to Figure 10.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Small increases have occurred in the sales of petrol (3%) since 2001 while diesel sales have increased by 21% between 2001 and 2007. Petrol sales have decreased slightly by 0.7% compared to 2005 sales, while diesel sales have risen. Since 2005 all marketed fuels are sulphur-free (<10ppm).

**Figure 10.2: Temporal trends in national sales of petrol and diesel (million litres)**

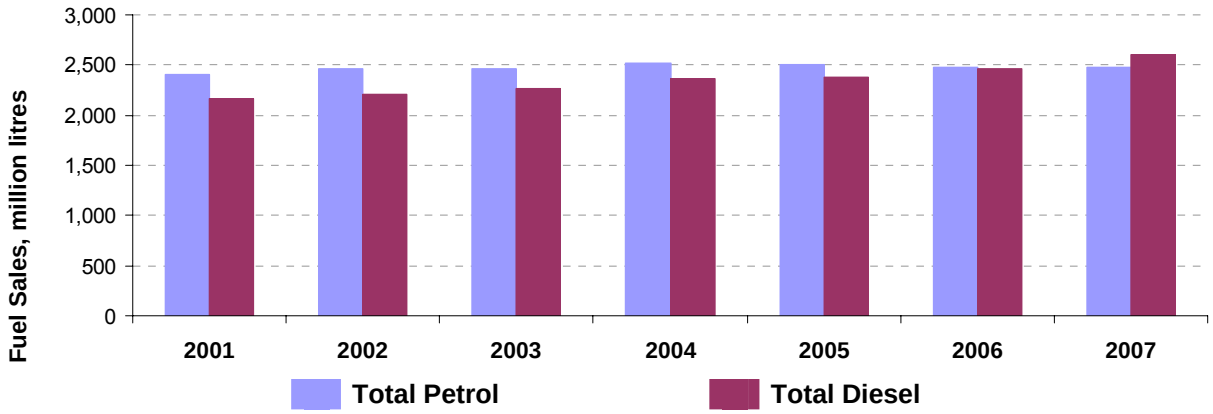



**Figure 10.3: Temporal trends in national sales of low sulphur petrol (%)**

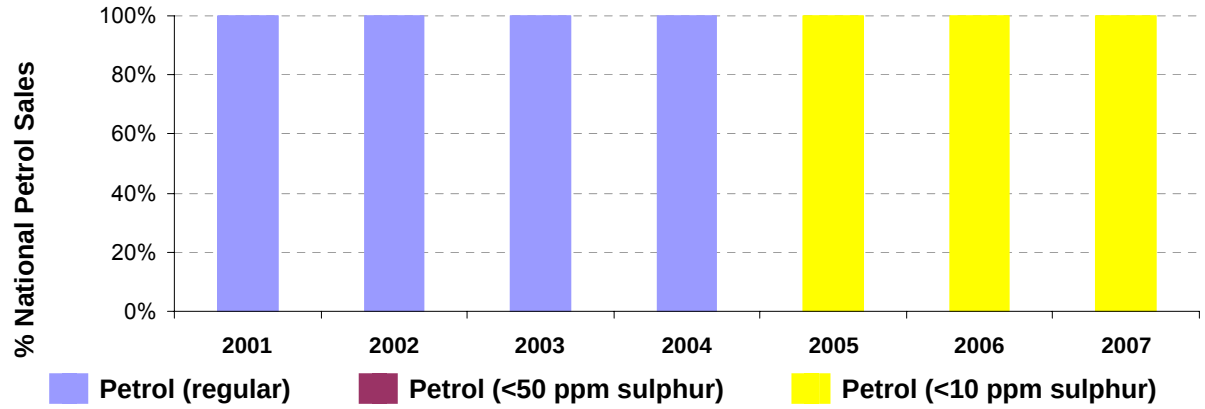


**Figure 10.4 Temporal trends in national sales of low sulphur diesel (%)**

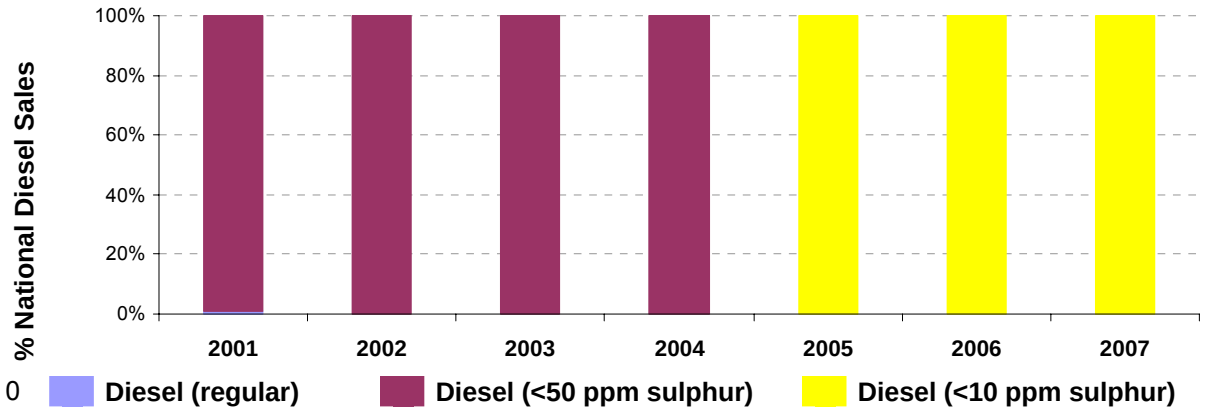
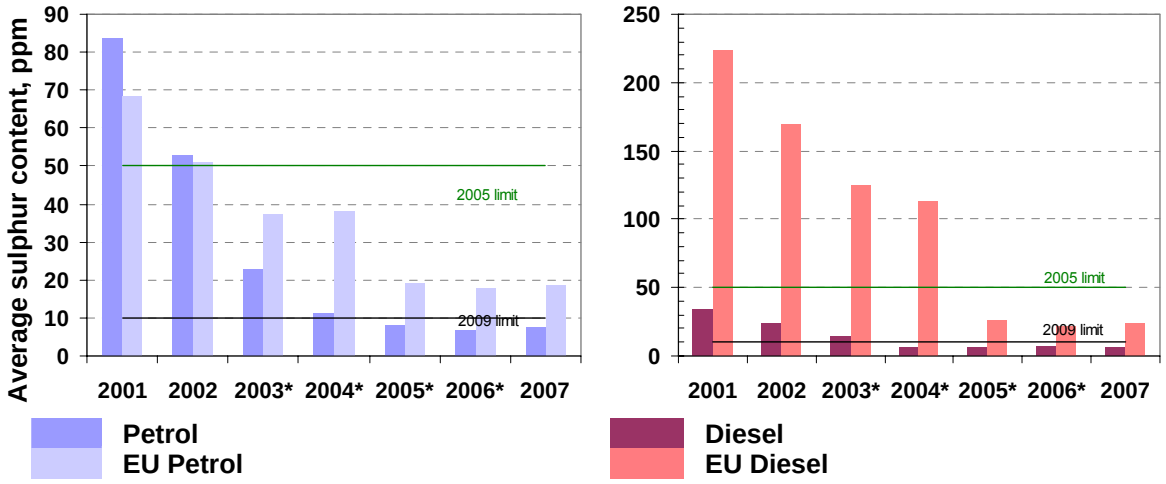



Figure 10.5 shows the trend in the average sulphur content of petrol and diesel fuels in Finland compared with the EU average (derived from sample analysis results and relative sales). The reduction in the average sulphur content of both petrol and diesel fuels since 2001 continued in 2005 with full market conversion to <10ppm fuels. The average sulphur content was well below the 2005 limit, EU average and the forthcoming 2009 limit since 2005.

**Figure 10.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 10.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • All samples for the analysis of Octane and Cetane numbers were taken from fuel refineries and terminals. Compliance with EN14274 requires analysis for all parameters to be carried out on samples to be taken from refuelling stations.<br>• No samples of 99 octane fuel were taken since the sales volume is less than 2% for Finland. |

# 11 France

## 11.1 Fuel Availability 2007

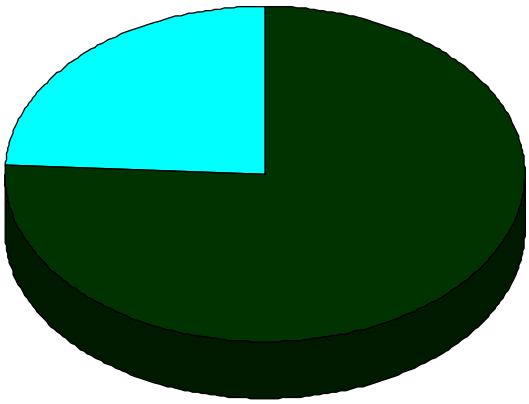
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

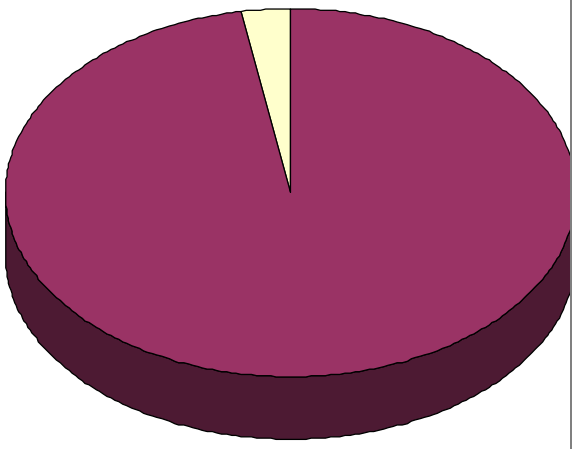
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Sans Plomb 95 | 5 |
| 12 | RON 98 | <10 ppm | Sans Plomb 98 | 12 |
| 14 | Diesel | <50 ppm | Gazole 50ppm | 14 |
| 15 | Diesel | <10 ppm | Gazole 10ppm | 15 |

### 11.1.1 Sales

**Figure 11.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 97.3% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 2.7% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 76.0% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 24.0% | | | |

Since 2001 France has switched entirely to low sulphur fuels (<50ppm), with <10ppm petrol of RON 98 grade accounting for 24% of sales in 2007 (less than the 26.6% of petrol sales in 2006). Small quantities of <10ppm diesel (2.7%) were also sold for the second year running, although comprising a lower percentage of sales than in 2006 (4%).

### 11.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur free fuels were available in significant quantities for petrol and diesel across France in 2007.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Most of the refuelling stations propose petrol with less than 10 ppm sulphur "Super sans plomb 98". Diesel with less than 10 ppm sulphur is labelled differently in all refuelling stations.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** Table 11.1 shows the average content of fuel sold in 2001 to 2007 in relation to the EU25 average. Data was unavailable for 2003-2005 as France submitted no report in these years.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 11.1: Annual trend in average sulphur content in petrol and diesel fuels**

| FR | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006* | 2007 | 2007 |
| *Petrol* | 93 | 103 | No data | No data | No data | 18 | 25 | 18 |
| *Diesel* | 295 | 308 | No data | No data | No data | 37 | 37 | 23 |

## 11.2 Fuel Quality Monitoring 2007

### 11.2.1 Description of system

***Responsible organisation(s):*** Direction des Ressources Energétiques et Minérales. (Directorate of Energy Resources and Minerals). Responsibility for Fuel Quality Monitoring & Reporting has been transferred to Direction Générale de l'Energie et du Climat (General directorate for energy and climate change) as of July 2008.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model B

***Country Size:*** Large (more than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** The relevant period for assessment of compliance is 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** The sampling took place during both winter and summer months. In winter samples were taken during December to April and summer month sampling took place during May and July.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** Gathered and published by the CPDP (Comité Professionnel du Pétrole).

### 11.2.2 Sampling and reporting

France was partially compliant with the sampling and reporting requirements in 2007. Sampling was carried out in 4 winter months and only 2 months during summer. France has not taken sufficient petrol samples (both fuel grades) in the summer period to comply with the requirements of the European standard for a large country using statistical model B (the requirement is for 200 samples per season) except for sampling numbers for the low sulphur diesel fuel grade (Diesel <50 ppm S). France is a country with a 'normal' summer period for assessment purposes (1st May to 30th September as per EN 14274). Diesel <10ppm fuel shows reduced sample reporting, however this fuel grade represents less than 3% of diesel sales and so is in accordance with sampling requirements. Table 11.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 11.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 76.0% | 135 | 260 | 400 | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 24.0% | 95 | 254 | 400 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **230** | **514** | **800** | **Yes** | **All of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 97.3% | 172 | 326 | 400 | Yes | All of 5 | (2) |
| 15 | Diesel <10 ppm S | 15 | 2.7% | 12 | 19 | 11 | Yes | All of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **264** | **345** | **411** | **Yes** | **All of 5** | **(2)** |

**Notes:** S = Summer; W = Winter
(1) Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value
(2) Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value

### 11.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* Of the samples tested, the limit values for RON, MON, DVPE, Olefins, Aromatics, Benzene, Oxygen content and ethers with 5 or more carbon atoms per molecule and Sulphur content (limiting value of 50ppm) were all exceeded by one or more samples.

Values, by parameter reached extremes of; MON 84.4, RON 90, 68.9 kPa, 20 % (v/v), 36.2, 1.1% (v/v), 3.1 (v/v), 18 % (v/v) and a maximum Sulphur content of 50.6 mg/kg.

*Statistical significance:* The tolerance limits for statistical significance were exceeded for two samples (RON), one sample (MON), three samples (summer vapour pressure), two samples (Olefins), one sample (aromatics), seven samples (benzene), two samples (oxygen content) and two samples (ethers).

The tolerance limit for Sulphur content has not been exceeded by the sulphur sample giving a value of 50.6 mg/kg and so the sample is compliant with the Directive.

***RON 98 Petrol***

| | |
|---|---|
| *Detail:* | The limit values for Vapour pressure DVPE, Hydrocarbon analysis (Aromatics and Benzene), Oxygen content, ethers and Sulphur content were all exceeded by at least one sample for sulphur free petrol grade. Values, by parameter, reached extremes of 78.3kPa, 38% and 1.4%, 2.8% and 15.7%. |
| *Statistical significance:* | The tolerance limit for statistical significance for the summer period vapour pressure is 61.8kPa using test method EN 13016-1 and 9 samples were non-compliant with the Directive, giving values of 61.89 kPa to 78.3 kPa. Other samples showed non-compliance values for aromatics, with a maximum of 38, during hydrocarbon analysis, 7 samples were non-compliant giving benzene values of 1.02% to 1.41%, 5 samples were non-compliant with the directive giving ether values of above 15.6%. |

***Diesel <50 ppm***

| | |
|---|---|
| *Detail:* | The sulphur content (regular grade) limit value of 50 mg/kg was exceeded by one sample with a value of 60.2 mg/kg. |
| *Statistical significance:* | The tolerance limit for statistical significance for the low sulphur diesel grade is 54mg/kg. One sample showed sulphur content of 60.2 mg/kg and so was non-compliant. |
| *Member State's notes:* | The overall (all grades) rate of non-compliance is less than 3% for all parameters controlled per grades. |

***Diesel <10 ppm***

| | |
|---|---|
| *Detail:* | No samples exceeded the limiting value. See additional note below for sulphur exceedance. |

***Additional Information:*** Testing of petrol RON 98 showed that six samples exceeded the sulphur tolerance limit of 11.6 mg/kg for test method EN ISO 20846 on sulphur free fuel giving values of 11.7, 32.5, 12.5, 12.6, 13 and 23.7 and so were also non-compliant with the Directive.

The diesel sulphur content (sulphur free grade) limit value of 10mg/kg was also exceeded by one sample with a value of 43 mg/kg, The tolerance limit for statistical significance for the sulphur content of sulphur free grade diesel is 12.0 mg/kg, therefore one sample was non-compliant with the Directive with the value of 43 mg/kg. The most important non-compliance concern for diesel is the sulphur content of 10ppm Diesel ("sulphur-free") with a rate of 3.23% non-compliance. For diesel 10ppm, the rate of non-compliance is linked to the low number of samples of diesel 10 ppm (e.g. 1 non-compliant result from 279 tests in the laboratory for 31 samples).

## 11.3Temporal trends

Figure 11.2 to Figure 11.5 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. France has supplied sales data for the years 2003-2005, where no reports were previously submitted. Petrol sales have decreased by 26% since 2001, whilst

diesel sales have increased by 16%. Low sulphur petrol and diesel, and sulphur free petrol were introduced into the market from 2005. Sulphur free diesel was available from 2006.

**Figure 11.2: Temporal trends in national sales of petrol and diesel (million litres)**

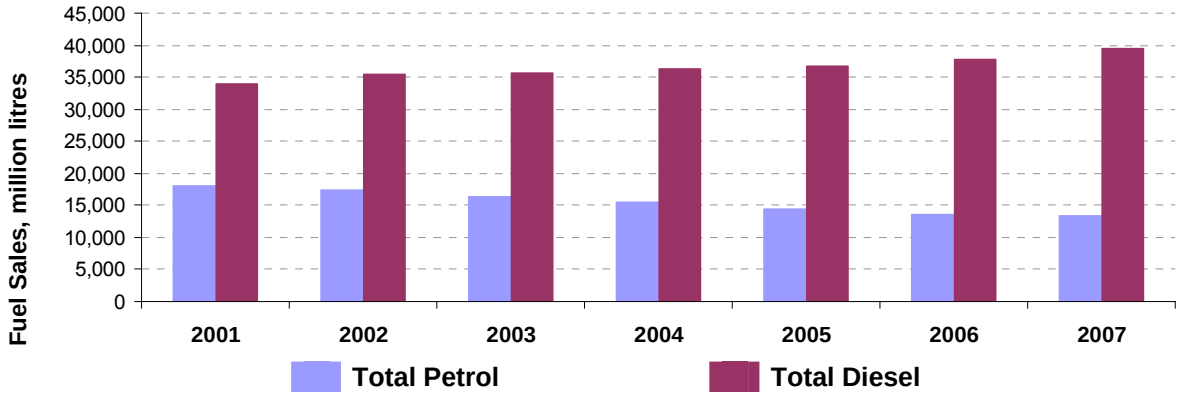



**Figure 11.3: Temporal trends in national sales of low sulphur petrol (%)**

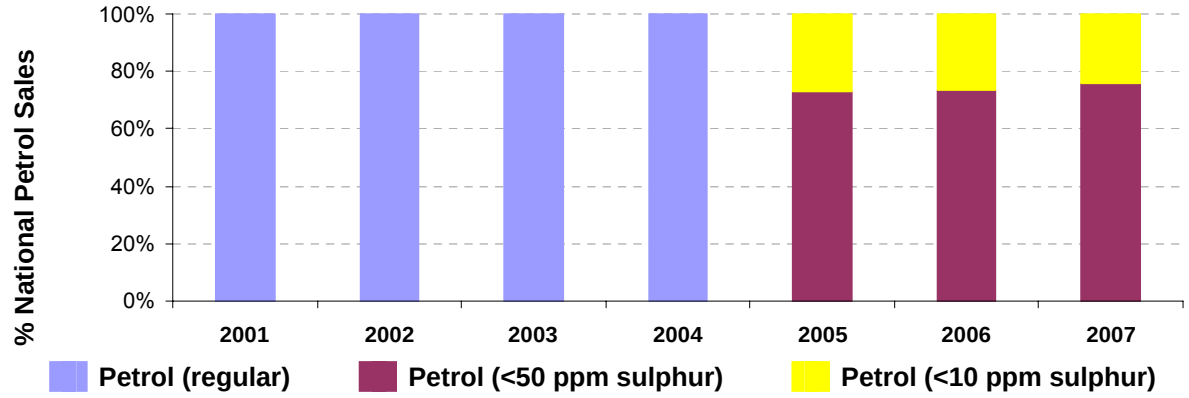



**Figure 11.4: Temporal trends in national sales of low sulphur diesel (%)**

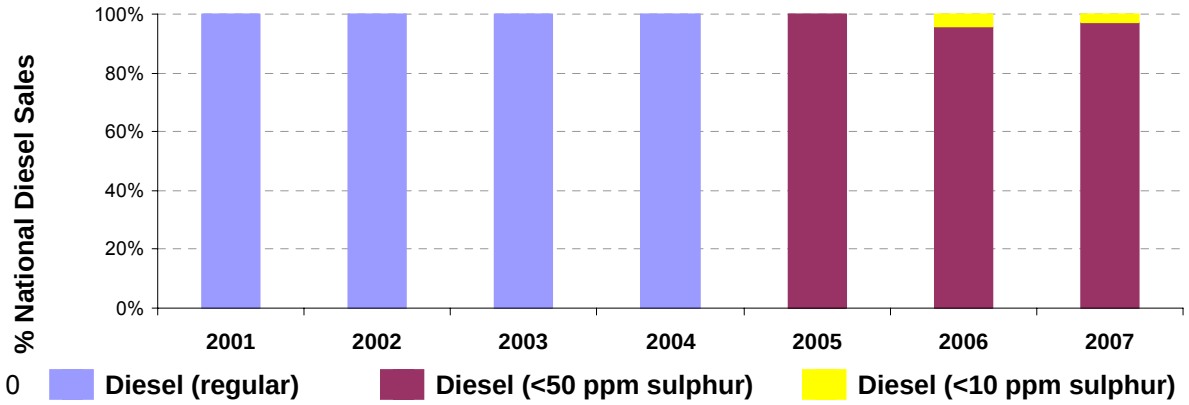
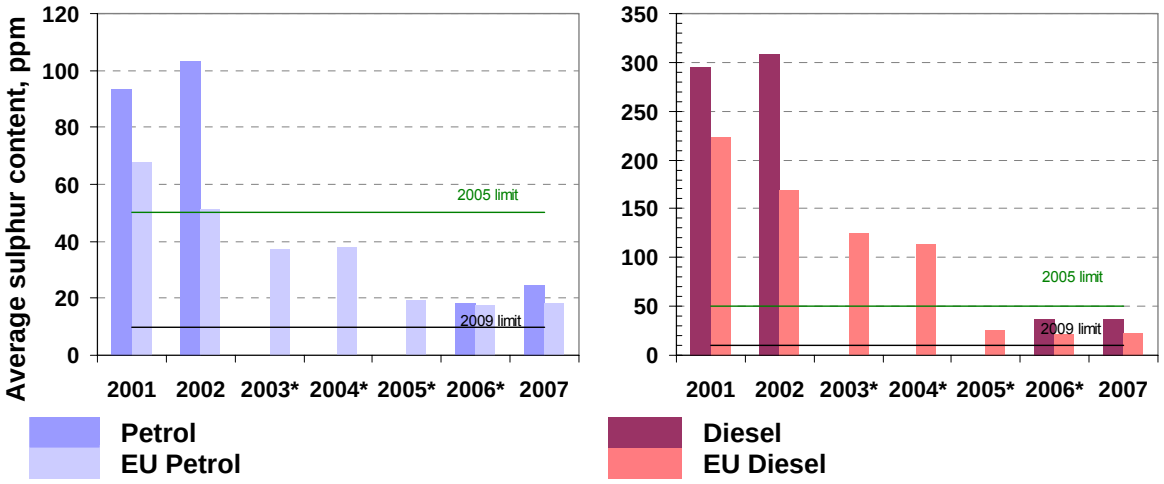



Figure 11.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average. Data was unavailable for 2003-2005 as France submitted no report in these years. The average sulphur content for both petrol and diesel was below the 2005 limit (<50 ppm) but above the EU average in 2007.

**Figure 11.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006, and includes new EU10 Member States from 2004.

## 11.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The report for France for 2007 has provided all of the information required under the Directive and no parameters were missing from the report.<br>• The total number of non-compliance with the Directive for petrol sampling was 48, and for diesel grades non-compliances totalled 2. France has stated that non-compliances were isolated cases and so action was not deemed to be necessary.<br>• The number of samples analysed was higher than for the previous year, however the minimum number of samples (200) required under the European Standard FQM sampling model was not met for 2 of the 4 fuel grades. Fewer than 200 samples of the RON 95 low sulphur fuel grade were taken in summer, and of the RON 98 sulphur-free fuel grade in summer and winter. |

# 12 Germany

## 12.1 Fuel Availability 2007

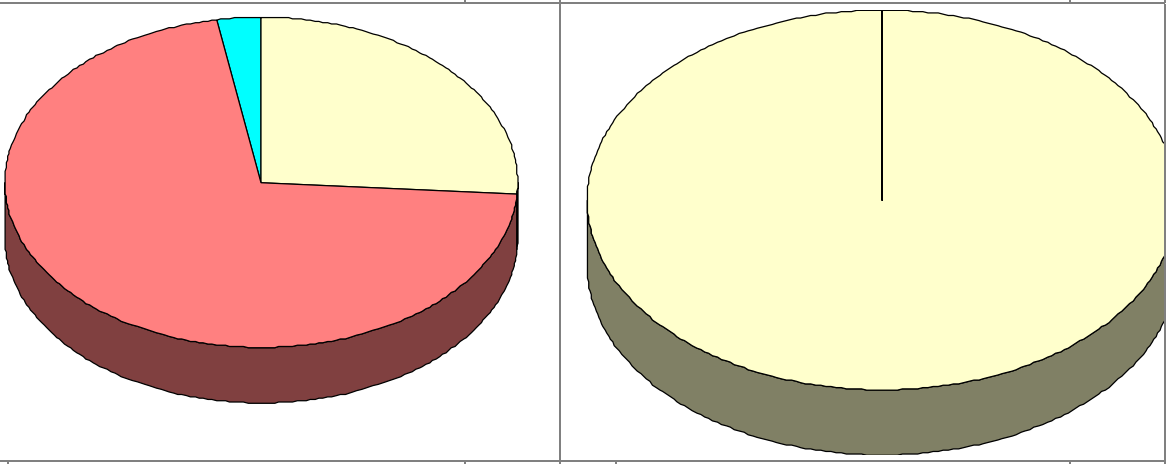
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 3 | RON 91 | <10 ppm | Normalbenzin | 3 |
| 6 | RON 95 | <10 ppm | Superbenzine | 6 |
| 12 | RON 98 | <10 ppm | Super Plus | 12 |
| 15 | Diesel | <10 ppm | Dieselkraftstoff | 15 |

### 12.1.1 Sales

**Figure 12.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|



| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 26.2% | 15 | Diesel (<10 ppm sulphur) | 100.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 71.0% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 2.9% | | | |

The German market switched entirely to sulphur free fuels at the beginning of 2003. All diesel fuel for sale in Germany is sulphur-free as are all petrol grades. RON 95 (<10ppm) comprises the majority of sales representing 71% whilst RON 91 (<10ppm) accounts for just over one quarter of petrol fuel sales.

### 12.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** The German market converted entirely to sulphur free fuels at the beginning of 2003.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes - only sulphur-free grades available.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased significantly since 2001. See Table 12.1.

***Additional information:*** Germany has been promoting the sale of sulphur free fuels since 1 January 2003 via tax incentives.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 12.1: Annual trend in average sulphur content in petrol and diesel fuels**

| DE | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 54 | 23 | 7 | 7 | 6 | 6 | 6 | 18 |
| *Diesel* | 249 | 31 | 8 | 7 | 7 | 8 | 8 | 23 |

## 12.2 Fuel Quality Monitoring 2007

### 12.2.1 Description of system

***Responsible organisation(s):*** Ministry for the Environment, Nature Protection and Safety for Nuclear Reactors (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit – BMU*)

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Large (more than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations.

***Time/frequency of sampling:*** Monthly throughout the year, except April.

***Specification of test methods:*** According to the test method specified in Directive 98/70/EC.

***Collection of sales data:*** The fuel sales volumes are collected and published, from oil data, by the Federal Office of Economics and Export Control (BAFA).

***Other details:*** Where non-compliant samples are discovered in Germany, if the distributor of the product is guilty of fraud or negligence, penalty fines are imposed on those guilty of the infringement.

### 12.2.2 Sampling and reporting

Germany was generally compliant with the sampling and reporting requirements in 2007, however it has still not provided information on whether its national monitoring system is equivalent in statistical confidence with the requirements of EN 14274. Excepting summer vapour pressure, sample results were not provided separately for summer and winter periods. The following Table 12.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 12.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 3 | RON 91 <10ppm S | 3 | 26.2% | 89 | 59 | - | No | All of 18 | |
| 6 | RON 95 <10 ppm S | 6 | 71.0% | 102 | 98 | - | No | All of 18 | |
| 12 | RON 98 <10 ppm S | 12 | 2.9% | 54 | 29 | - | No | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **245** | **186** | **-** | **No** | **All of 18** | |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 127 | 138 | - | No | All of 5 | |
| **D** | **Total Diesel** | | **100%** | **127** | **138** | **-** | **No** | **All of 5** | |

**Notes:** S = Summer; W = Winter
(1) No information was provided on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274

### 12.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 91***

*Detail:* The RON, summer vapour pressure, olefins and aromatics limits of 91, 60 kPa, 18 %(v/v) and 35 %(v/v) respectively were exceeded by a number of samples with values reaching extremes of 90.3, 65.7 kPa, 20.7 %(v/v) and 35.5 %(v/v).

*Statistical significance:* The tolerance limits for statistical significance for the RON, summer vapour pressure and olefins test methods are 90.6, 61.8 kPa and 19.5 %(v/v). The samples exceeded these values and were therefore in non-compliance with the Directive.

The aromatics limit for statistical significance is 36.0%(v/v) according to test method EN 14517; therefore the samples were in compliance with the Directive.

*Member State's notes:* Measures have been taken by the member state to initiate a penalty procedure against Summer vapour pressure non-compliance.

***Petrol RON 95***

*Detail:* The RON, MON, summer vapour pressure, aromatics and other oxygenates limits of 91, 85, 60 kPa , 35 %(v/v) and 10 %(v/v)respectively were exceeded by a number of samples with values reaching extremes of 94.7, 84.8, 66.3 kPa, 37.1 %(v/v) and 11.4 %(v/v).

*Statistical significance:* The tolerance limits for statistical significance for the summer vapour pressure, other oxygenates test methods and Aromatics (according to test method EN 14571) are 61.8 kPa, 10.5 %(v/v) and 39 % (v/v/) The samples exceeded these values and were therefore in non-compliance with the Directive.

The tolerance limits for statistical significance for the RON and MON test methods are 94.6, 84.5 and therefore the samples were in compliance with the Directive.

***Petrol RON 98***

*Detail:* The summer vapour pressure, distillation at 100 °C, aromatics, oxygen content, ethers and other oxygenates limits of 60 kPa,46.0 %(v/v), 35 %(v/v), 2.7%(v/v), 15%(v/v) and 10%(v/v) respectively were exceeded by a number of samples with values reaching extremes of 61.5 kPa, 43.2 %(v/v), 37 %(v/v), 2.79%(v/v), 15.3%(v/v) and 14.8%(v/v).

*Statistical significance:* The tolerance limits for statistical significance for distillation at 100°C, other oxygenates and aromatics (43.6, 10.5 and 36 %v/v) were exceeded and therefore the samples were in non-compliance with the Directive.

The tolerance limits for summer vapour pressure, oxygen content and ethers were not exceeded and therefore the samples were in compliance with the Directive.

*Member State's notes:*

***Diesel***

*Detail:* The limit values for cetane (min. 51), distillation at 95% (max. 360$^{o}$C), PAH (11 %m/m) and sulphur (50ppm) were exceeded by samples with values of 48, 367.5 $^{o}$C, 26.9 %m/m and 162 ppm respectively.

*Statistical significance:* The tolerance limit values for statistical significance for the above parameters (48.5, 365.9, 13.2, 54 to 61.8 respectively) were exceeded and therefore the samples were not compliant with the Directive.

*Member State's notes:*

***Additional information***: In addition to the above non-compliances with the Directive, there were the following exceedances of the <10ppm sulphur content limit for fuel marketed as sulphur-free:

- One sample of RON 91 petrol exceeded the limiting value for a sulphur free fuel with a maximum sulphur content of 32.5 ppm; and
- One sample of RON 95 petrol exceeded the limiting value for a sulphur free fuel with a maximum sulphur content of 15.0 ppm.

Both samples were within the overall sulphur content tolerance limit of 61.8 mg/kg and were therefore in compliance with the Directive.

## 12.3 Temporal trends

Figure 12.2 to Figure 12.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Between 2001 and 2007, sales of petrol have decreased steadily from by 23% and diesel sales have also decreased since 2001 (11%). Since the beginning of 2003, all petrol and diesel fuel available in Germany are sulphur free grades.

**Figure 12.2: Temporal trends in national sales of petrol and diesel (million litres)**

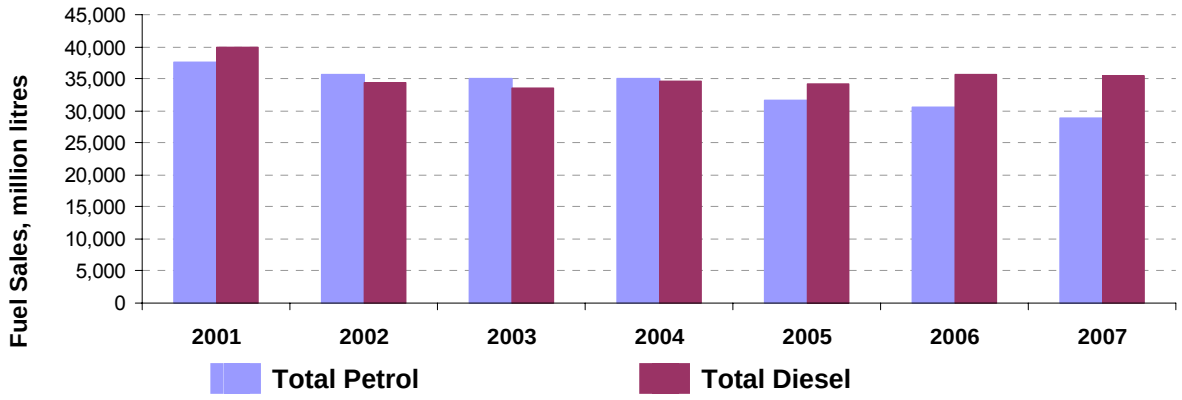



**Figure 12.3: Temporal trends in national sales of low sulphur petrol (%)**

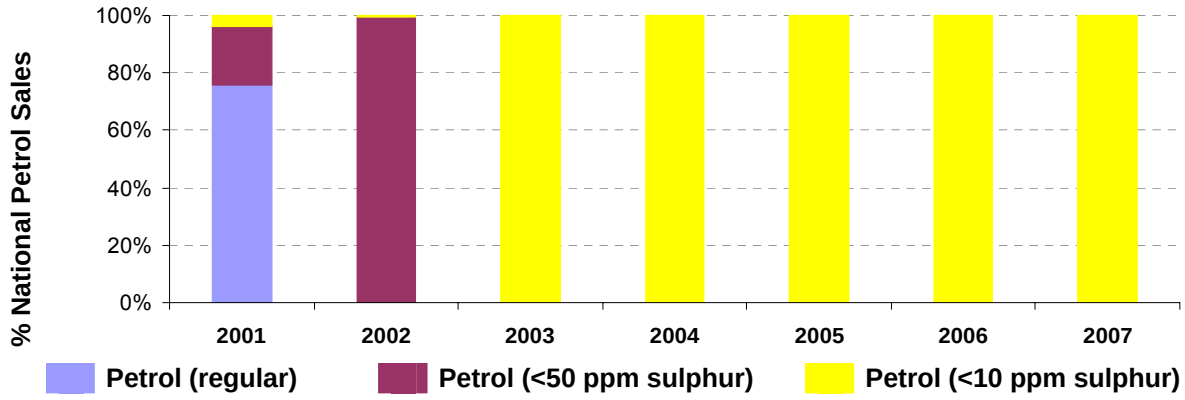



**Figure 12.4: Temporal trends in national sales of low sulphur diesel (%)**

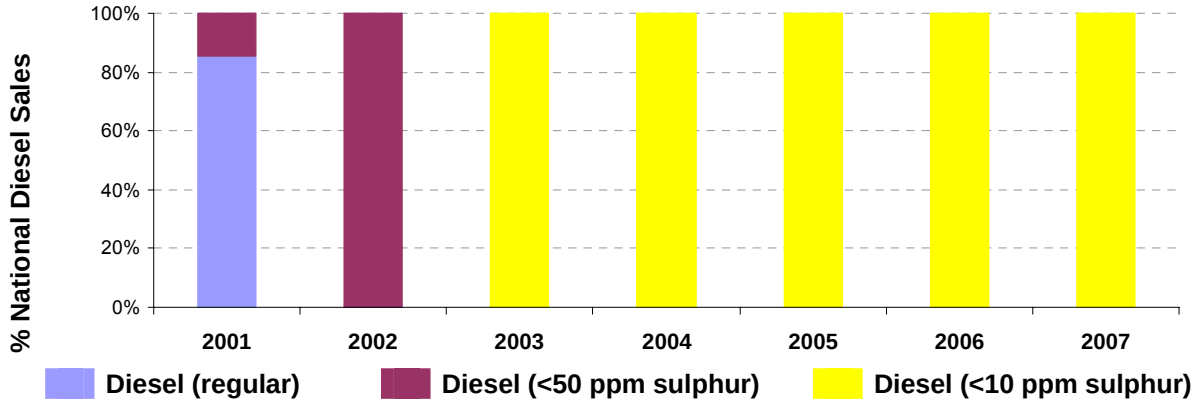
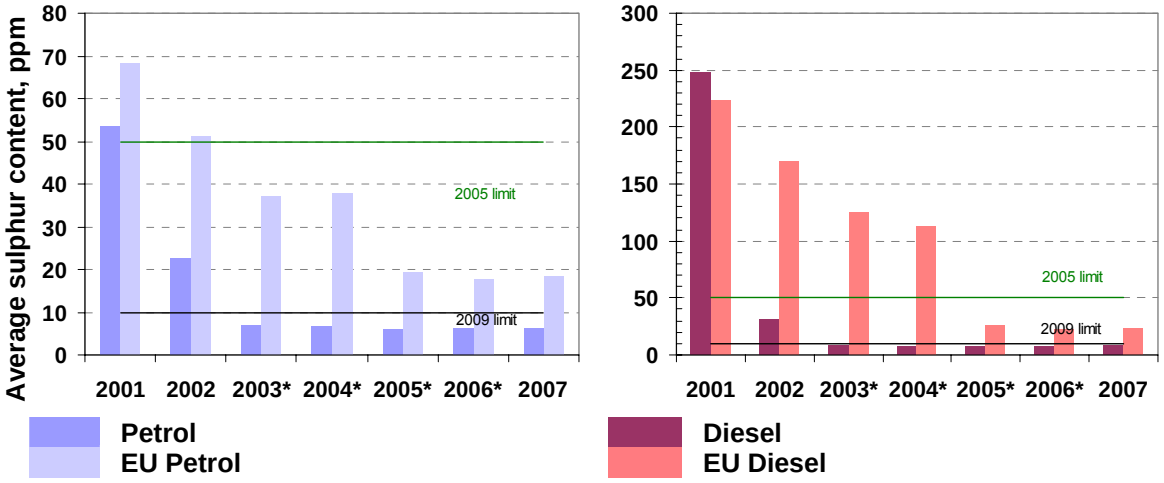



Figure 12.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). The average sulphur content of both petrol and diesel fuels has decreased since 2001 with levels remaining at a similar level since full market conversion to <10ppm fuels at the beginning of

2003. The average sulphur content for both petrol and diesel were well below the 2005 limit and EU average and were also below the forthcoming 2009 limit.

**Figure 12.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 12.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The report submission was received almost 3 months after the 30 June 2007 deadline, although this is a significant improvement on previous years.<br>• Germany has not provided information on whether its national monitoring system is equivalent in statistical confidence with the requirements of EN 14274.<br>• Summer and winter results should be reported separately.<br>• Detail on numbers of non-compliances and action taken were not supplied in the report. |

# 13 Greece

## 13.1 Fuel Availability 2007

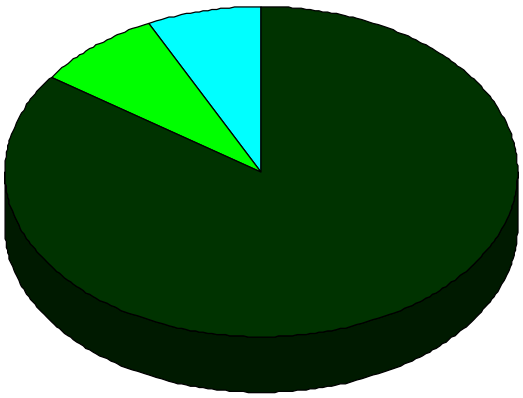
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

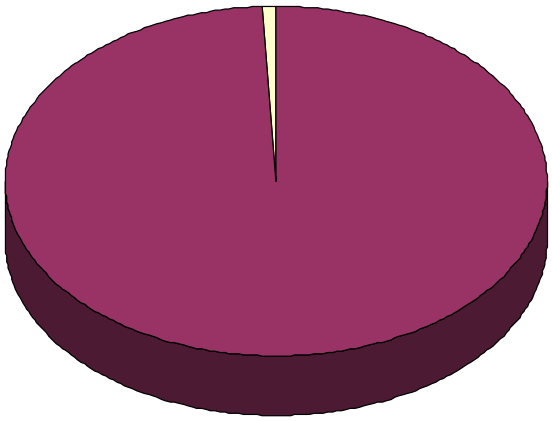
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | UNLEADED | 5 |
| 8 | 95<RON<98 | <50 ppm | LRP | 8 |
| 12 | RON 98 | <10 ppm | UNLEADED SULPHUR FREE | 12 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel <10ppm | 14 |

### 13.1.1 Sales

**Figure 13.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 99.1% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 0.9% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 84.7% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 8.1% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 7.2% | | | |

Figure 13.1 above shows that the majority of petrol sold in Greece in 2007 (84.7%) was RON 95 level. Sulphur-free fuel sales were available for RON 98 petrol and diesel, though total

sales were low (only slightly up on the previous year). Sales of Lead Replacement Petrol (LRP) were reported under Unleaded petrol 95=<RON<98.

### 13.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Refineries in Greece now produce all the unleaded petrol of 100 RON sulphur free. Due to the fact that the percentage of refuelling stations that sell this fuel grade of petrol is over 60%, a high availability market is assured. According to the Commission Recommendation of 12th January 2005 (2005/27/ec), there is no need to prove the availability of sulphur free petrol on an equal balanced geographical basis. With regard to sulphur free diesel, only one international petroleum company sells diesel sulphur free in its retail outlets. Of their total 1,019 petrol stations only 44 sell sulphur free diesel. Greek refineries are able to produce this fuel grade but there is no demand from the fuel market.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** As shown in Table 13.1, the average sulphur content of petrol and diesel decreased significantly from 2001 to 2006 but remained the same from 2006 to 2007.

***Additional information:*** The high average diesel sulphur content in 2002 may simply be an artefact due to the very high content of some of the samples taken due to contamination with heating or marine oil.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 13.1: Annual trend in average sulphur content in petrol and diesel fuels**

| EL | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 108 | 72 | 92 | 69 | 38 | 26 | 26 | 18 |
| *Diesel* | 281 | 500 | 290 | 283 | 38 | 34 | 34 | 23 |

## 13.2 Fuel Quality Monitoring 2007

### 13.2.1 Description of system

***Responsible organisation(s):*** The official sampling authorities in Greece are Service of Special Controls (YPEE) of the Ministry of Economics and Finance, Inspection Teams for the Trading and Storage of Fuel (KEDAK) of the Ministry of Development, and Division of control of atmospheric pollution and noises (EARTH) of the Ministry of Environment. Samples are tested at the General State Chemical Laboratory (GSCL).

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model A

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** The samples are taken at refineries. Greece reported that samples are also taken from petrol stations from various authorities which are tested for environmental or other financial reasons. However, those samples are not tested according to the FQMS and as such they are not included in this report.

***Time/frequency of sampling:*** Monthly throughout the year.

***Specification of test methods:*** According to Directive 98/70/EC.

***Collection of sales data:*** Ministry of Development.

***Other details:*** The monitoring system has been designed, but it was not fully applied in 2007 again (as in 2004 to 2006). According to the Joint Ministerial Decision No 291/2004, the General Greek Chemical State Laboratory (GCSL) is responsible for controlling the quality of petrol and diesel fuels and reporting on the fuel quality monitoring system. Fuel samples are collected from GCSL chemists at the refineries. This report concerns the results of the samples that are taken at the refineries. The official sampling authorities (YPEE, KEDAK, EARTH) collect samples from the storage tanks of the marketing companies and the petrol stations but they follow the national fuel quality system. This is the main technical reason why the monitoring system of EN 14274 has not been fully applied.

All the mandatory fuel parameters, according to directive 98/70/EC, are measured in the laboratories of the refineries. Each year more than 4,000 samples are tested for adulteration and smuggling reasons by the GCSL laboratories. The national fuel quality system is based on markers and sulphur content detects any adulteration of fuels. However, the applied monitoring system for smuggling reasons is different than that of the standard EN 14274, and as such it has not been counted in the present statistical analysis.

The following has been accomplished for 2007, but took effect in 2008: In Athens, the department EARTH of the Ministry of the environment has undertaken exclusively the collection of the samples taken at the petrol stations in Athens according to the standard EN 14274. The Ministry of Development is going to be responsible for reporting the sales of fuels.

### 13.2.2 Sampling and reporting

Greece was not compliant with the sampling and reporting requirements in 2007 (as for 2005 and 2006), as the report concerns the results of the samples that are taken at refineries only, and none from refuelling stations as required by EN 14274. Also, the minimum number of samples (50) required under the chosen Fuel Quality Monitoring System (European Standard model A) was not met for the RON 95 low sulphur fuel grade in summer, when only 41 samples were taken. The number of samples of the other petrol grades in summer was also less than 50 but this is acceptable given their low share of total fuel sales.

The following Table 13.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 13.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 84.7% | 41 | 67 | 100 | Yes | All of 18 | (1) |
| 8 | 95<RON<98 <50 ppm S | 8 | 8.1% | 40 | 53 | 9 | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 7.2% | 43 | 45 | 8 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **124** | **165** | **117** | **Yes** | **All of 18** | **(1)(2)** |
| 14 | Diesel <50 ppm S | 14 | 99.1% | 55 | 65 | 100 | Yes | All of 5 | |
| 15 | Diesel <10 ppm S | 14 | 0.9% | 0 | 0 | | | | |
| **D** | **Total Diesel** | | **100%** | **55** | **65** | **100** | **Yes** | **All of 5** | **(1)(2)** |

**Notes:** S = Summer; W = Winter
(1) Sulphur exceeded <10 but complied with <50 Directive limit
(2) The FQMS has been designed, but it has not been fully applied for the year 2007 (as for 2004-2006). This report concerns the results of the samples that are taken at refineries.

### 13.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95***

All samples tested were in compliance with Directive limit values.

***Petrol RON 95-98, LRP***

All samples tested were in compliance with Directive limit values.

***Petrol RON 98***

All samples tested were in compliance with Directive limit values.

***Diesel***

*Detail:* Four samples of the diesel sulphur-free grade exceeded the <10ppm sulphur content limit for diesel fuel marketed as sulphur-free, with sulphur content recorded as 14, 14, 15 and 15.5 ppm.

*Statistical significance:* All samples tested were in compliance with Directive limit values, including the sulphur limit of 50 ppm.

*Member State's notes:*

## 13.3 Temporal trends

Figure 13.2 to Figure 13.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Sales of petrol increased by 77% between 2001 and 2006 (up 40% between 2002 and 2003), with sales of diesel increasing to 2004 and then decreasing by 23% in 2004-2006. 2007 sales figures however have shown an increase in diesel sales since 2001 of 52%. The large petrol increase has been attributed by Greece to sales of Lead Replacement Petrol (LRP – reported under Unleaded petrol 95=<RON<98) being provided for the first time for 2003. LRP comprised almost 14% of total sales in 2005 and would explain the large increase in total sales since 2001 and 2002 (when LRP data was not

available). An increase in small quantities of sulphur-free RON 98 petrol (7.3% in 2007 from 6.3% in 2006) has also been reported. Sales of sulphur free diesel, however have decreased from 1.6% in 2006, to .09% in 2007.

**Figure 13.2: Temporal trends in national sales of petrol and diesel (million litres)**

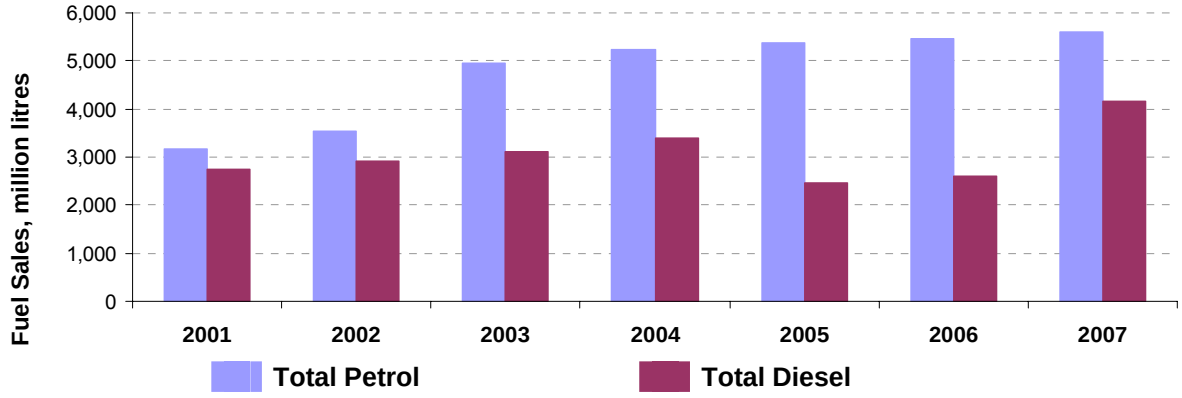



**Figure 13.3: Temporal trends in national sales of low sulphur petrol (%)**

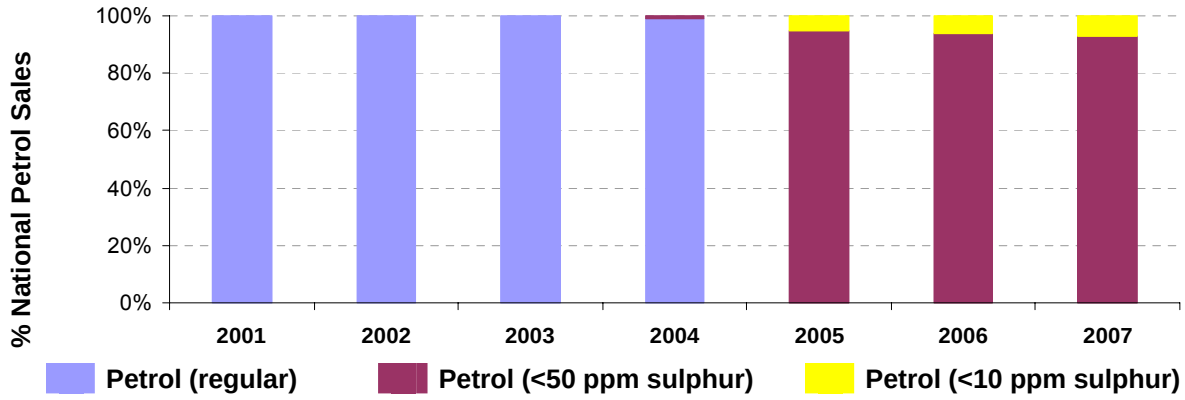



**Figure 13.4: Temporal trends in national sales of low sulphur diesel (%)**

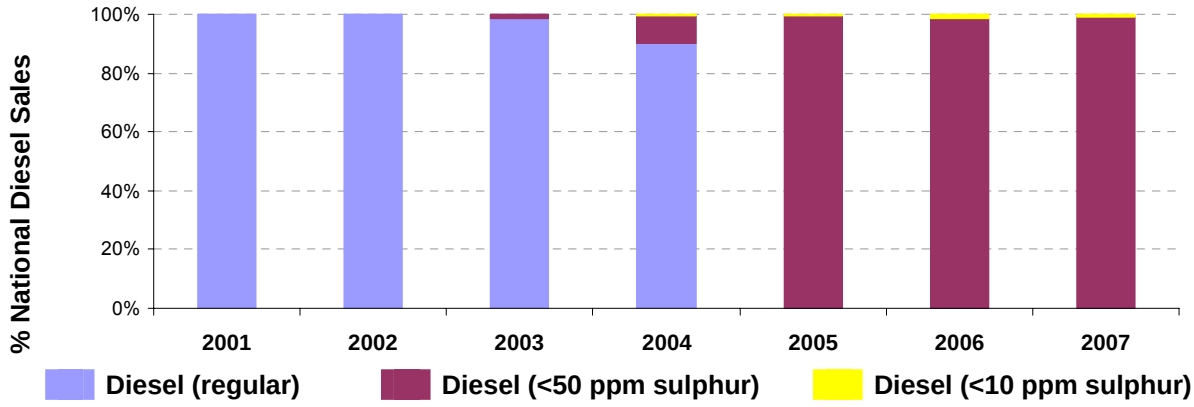
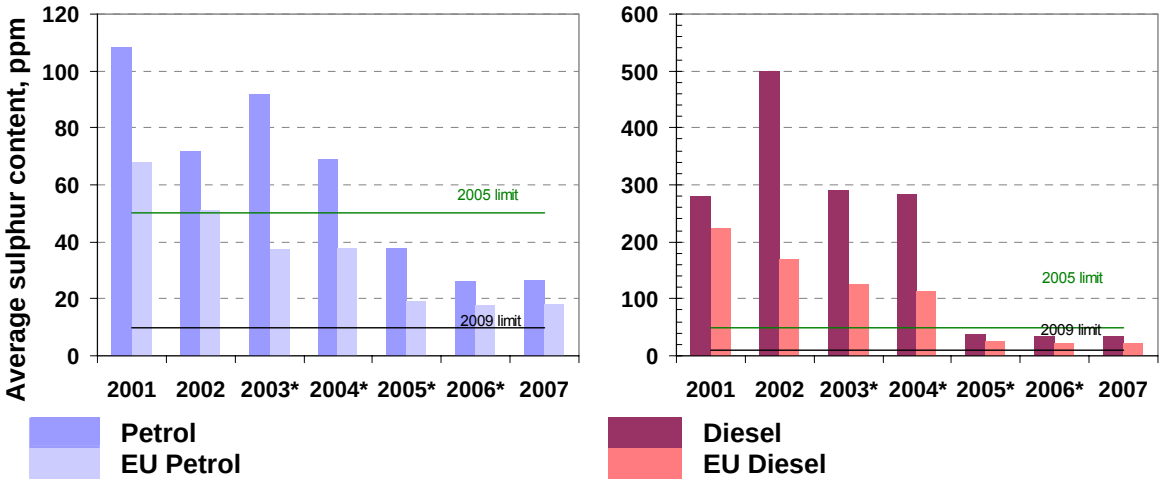



Figure 13.5 shows the trend in the average sulphur content of petrol and diesel fuels in Greece compared with the EU average. The average sulphur content of both petrol and diesel fuels has decreased since 2001 with a substantial drop in 2005 as a result of the switch from 'regular' to low-sulphur and sulphur-free fuels. The average sulphur content for petrol and diesel in 2007 was below the 2005 limit but above the EU average and the 2009 limit.

**Figure 13.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5, and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 13.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Samples were only taken at refineries, whereas EN 14274 requires samples to be taken at refuelling stations.<br>• The minimum number of samples (50) required under the chosen Fuel Quality Monitoring System (European Standard model A) was not met for the RON 95 low sulphur fuel grade in summer, when only 41 samples were taken. The number of samples of the other petrol grades in summer was also less than 50 but this is acceptable given their low share of total fuel sales. |

# 14 Hungary

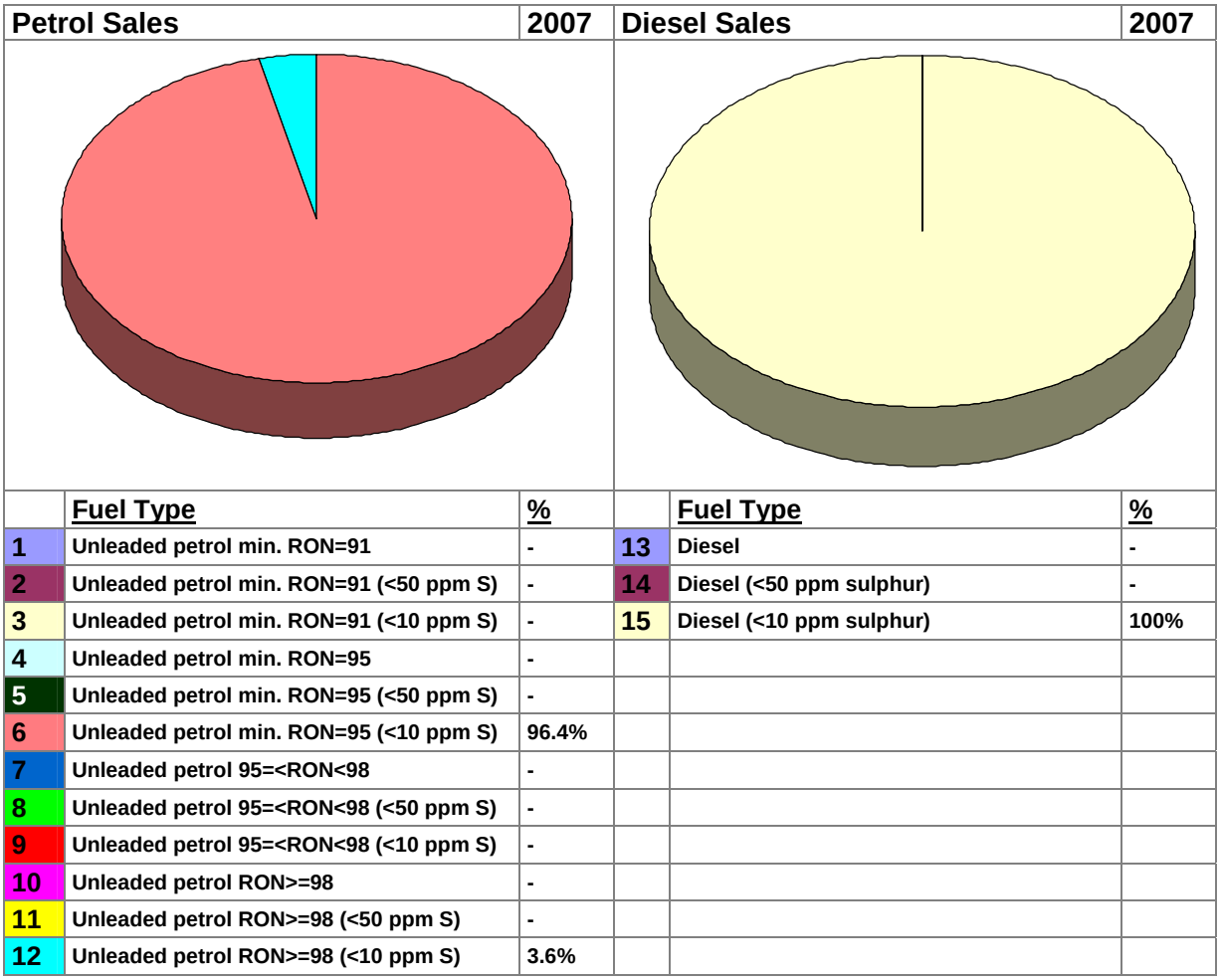
## 14.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 6 | RON 95 | <10 ppm | ESZ-95 | 6 |
| 12 | RON 98 | <10 ppm | ESZ-98 (and premium products) | 12 |
| 15 | Diesel | <10 ppm | Diesel Fuel | 15 |

### 14.1.1 Sales

**Figure 14.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 100% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 96.4% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 3.6% | | | |

Figure 14.1 shows that all fuels sold in Hungary in 2007 were sulphur free fuel grades. The majority of petrol sold in 2007 comprised RON 95 (96.4%) – an increase on 2006, with a small percentage of sales comprised of RON 98 (3.6%).

### 14.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Only sulphur-free fuels are sold at filling stations.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** N/A, all fuels sold were sulphur-free.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** N/A, all fuels sold were sulphur-free.

***Average sulphur content of all petrol and diesel sold:*** Table 14.1 shows the average content of fuel sold in relation to the EU25 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 14.1: Annual trend in average sulphur content in petrol and diesel fuels**

| HU | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 13 | 9 | 4 | 6 | 18 |
| *Diesel* | | | | 31 | 11 | 8 | 6 | 23 |

## 14.2 Fuel Quality Monitoring 2007

### 14.2.1 Description of system

***Responsible organisation(s):*** ÁMEI Petroleum Products Quality Inspection Company

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** Samples were taken most months across the winter and summer periods, although no samples were taken for any fuel grade in April and October.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** The data of national sales originated from Hungarian Petroleum Association (MÁSZ) and from Hungarian Customs and Finance Guard (VPOP).

***Other details:*** Hungary with the annual automotive fuel sales of 3.523 thousand tons is considered a small size country and fuels marketed in Hungary originate from different sources, i.e. local refineries and abroad through independent traders. Fuels produced in a refinery can appear in all part of the country due to the complicated logistic scheme and small geographical distances. All fuels marketed in Hungary are sulphur free fuels, so it can be stated that the Hungary fulfil requirements of geographic availability of sulphur free fuels (Number of filling stations is 1762).

### 14.2.2 Sampling and reporting

Hungary was essentially compliant with the sampling and reporting requirements in 2006. However for fuel category minimum RON >= 98 & < 10 ppm Sulphur, known as national grade: ESZ-98 Super premium unleaded petrol, only 18 samples were taken during the full year of reporting, with no samples tested during April, May, July or October. Fuel grade, minimum RON >= 98 & < 10 ppm Sulphur represents 27% of national sales and so sampling should have met with the requirements of the Directive, with 50 samples in summer and in winter.

The following Table 14.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 14.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 6 | RON 95 <10 ppm S | 6 | 96.4% | 53 | 50 | 100 | Yes | All of 18 | |
| 12 | RON 98 <10 ppm S | 12 | 3.6% | 8 | 10 | 4 | Yes | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **61** | **60** | **104** | | | |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 61 | 60 | 100 | Yes | All of 5 | |
| **D** | **Total Diesel** | | **100%** | **61** | **60** | **100** | | | |

**Notes:** S = Summer; W = Winter

### 14.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* One sample exceeded the limit value of 60kPa during the summer season giving a value of 61.3 kPa.

*Statistical significance:* The tolerance limit for statistical significance for summer vapour pressure is 61.8 kPa, so the sample was compliant with the Directive.

***RON 98 Petrol***

*Detail:* The limiting values of Summer Vapour pressure, Aromatics, Oxygen content and Ethers were all exceeded on at least one occasion giving values of (respectively) 63.8 kPa, 38 % (v/v), 208 % (m/m) and 15.4 % (v/v).

*Statistical significance:* The tolerance limit for statistical significance for summer vapour pressure is 61.8 kPa, so the sample was outside the tolerance limits and therefore non-compliant. The sample with 38 %v/v aromatics content exceeded the tolerance limit of 37.2 %v/v and was therefore non-compliant with the Directive. The tolerance limits for oxygen content (2.8 % m/m) and ethers (15.4 5 v/v) were not exceeded and so these samples were compliant with the Directive.

***Diesel***

All samples tested were in compliance with limit values.

## 14.3 Temporal trends

Figure 14.2 to Figure 14.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. In Hungary, both petrol and diesel sales had decreased in 2007 compared to 2006.

**Figure 14.2: Temporal trends in national sales of petrol and diesel (million litres)**

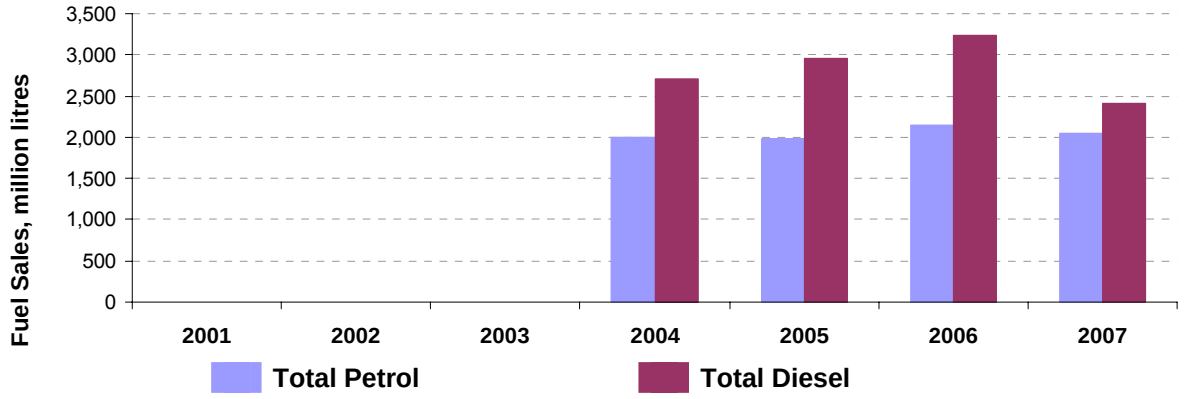



**Figure 14.3: Temporal trends in national sales of low sulphur petrol (%)**

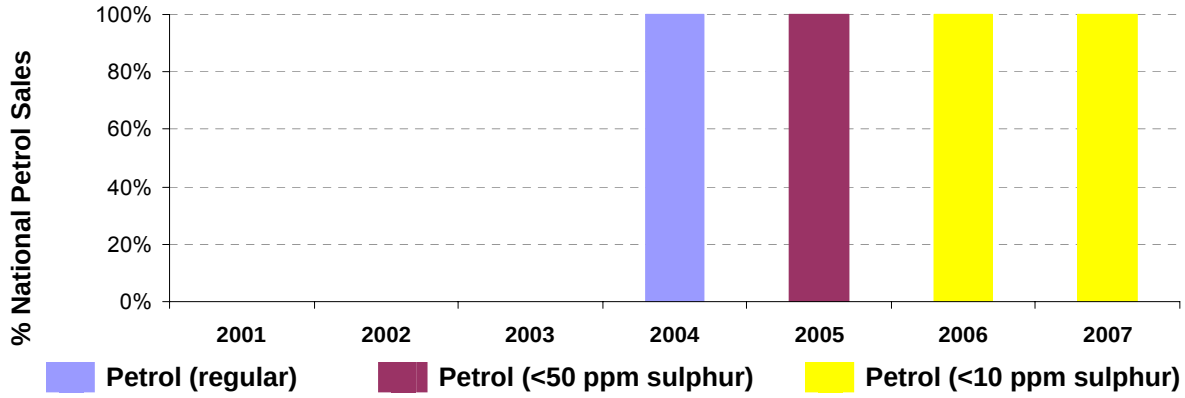



**Figure 14.4: Temporal trends in national sales of low sulphur diesel (%)**

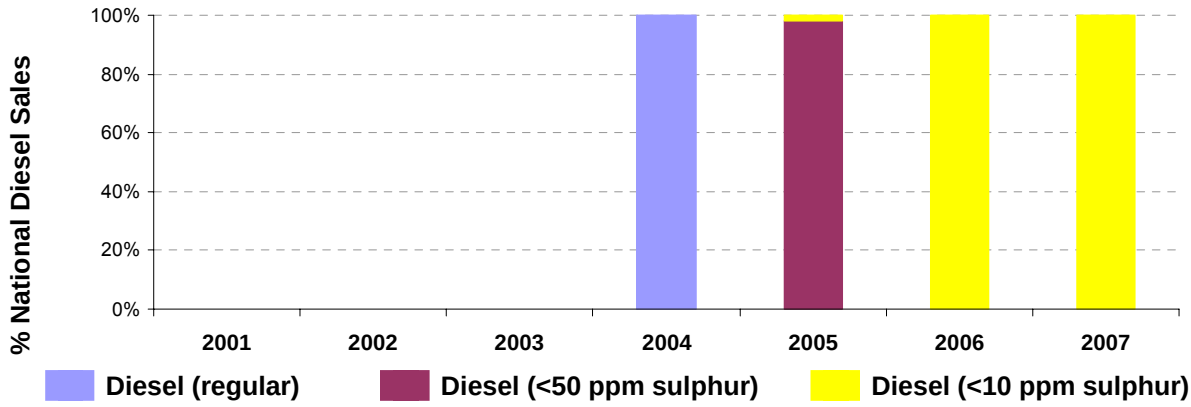
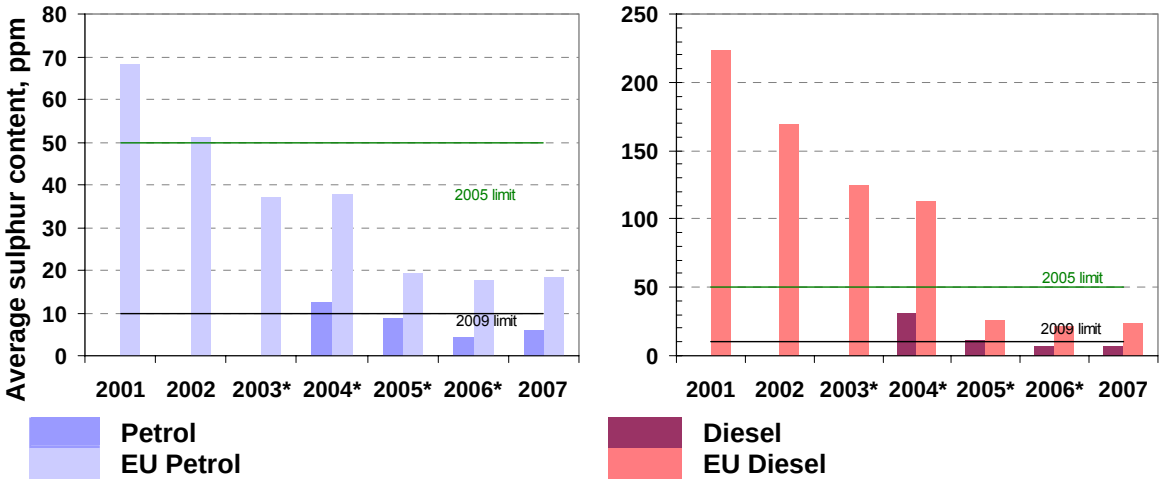



Figure 14.5 shows the trend in the average sulphur content of petrol and diesel fuels in Hungary compared with the EU average. The average sulphur content of both petrol and diesel has reduced since 2004 with full market conversion to <10 ppm in 2005. The average

sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm) and the EU average. In 2007 the average sulphur content continued to remain below the forthcoming 2009 limit for both petrol and diesel.

**Figure 14.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 14.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Hungary did not analysed 50 or more samples during both summer and winter period for fuel grade minimum RON >= 98 & < 10 ppm Sulphur, testing only 18 samples for this fuel grade. Given the proportion of national sales that this fuel represents, it is recommended that the fuel grade should meet minimum sampling requirements.<br>• Hungary has used FQMS Statistical Model C. Given the size of the country and the complexity of the fuel supply it is recommended that it investigates whether Models A or B may be more appropriate. |

# 15 Ireland

## 15.1 Fuel Availability 2007

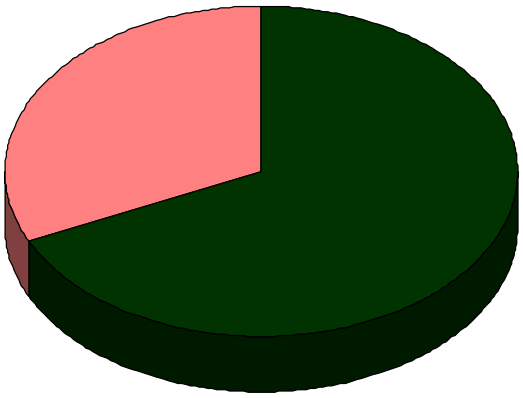
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

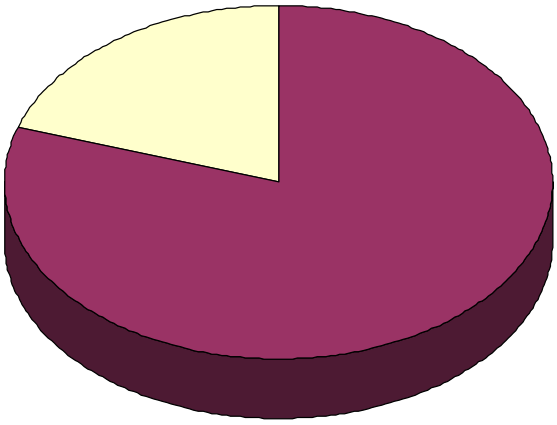
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | 95 unleaded | 5 |
| 6 | RON 95 | <10 ppm | 95 unleaded | 5 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel | 14 |

### 15.1.1 Sales

**Figure 15.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 79.9% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 20.1% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 68.0% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 32.0% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 15.1 demonstrates that petrol in Ireland in 2007 is primarily available at RON 95 grade (68%, compared to 71% in 2005 and 73% in 2004), with 32% (29% in 2005) sulphur free. Sulphur-free diesel was a new grade in 2005 and in 2007 comprised 20.1% of all diesel sales. This is a reduction in sales for this diesel grade for 2007 compared to 31.7% in 2006.

### 15.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Petrol and Diesel produced by the refinery at Whitegate in 2007 were sulphur free at approximately 2 parts per million. The distribution of this material is by road to cover the Munster area and to sea fed terminals at Limerick, Galway and New Ross. In total this accounted for some 32.04% of national sales of petrol in 2007 and, geographically, covers Munster, parts of the midlands, western seaboard and south-eastern region. The eastern seaboard to the north of, and including, the Dublin region is not an area in which this product is supplied nor is it supplied in the north-west of the country. With regard to imports it is difficult to ascertain the tonnages of sulphur-free fuel on the market, as the product is still marketed at 50ppm and not 10ppm. However, since the UK, which supplies over 60% of the market moved to increase the supply of 10ppm diesel and certain petrols late in 2007, it is likely that more of the material imported in 2008 will be to the 10ppm specification.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel had decreased steadily since 2001 in 2006. However, 2007 sees the sulphur content of Petrol remain static, whereas although the sulphur content for diesel increased from 14 in 2006 to 22 in 2007 it shows decrease on sulphur content levels in 2001, see Table 15.1.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 15.1: Annual trend in average sulphur content in petrol and diesel fuels**

| IE | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 83 | 57 | 52 | 43 | 20 | 17 | 17 | 18 |
| *Diesel* | 231 | 49 | 42 | 32 | 27 | 14 | 22 | 23 |

## 15.2 Fuel Quality Monitoring 2007

### 15.2.1 Description of system

***Responsible organisation(s):*** Department of the Environment Heritage and Local Government

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions)

***Location(s) of sampling:*** Ireland has one national oil refinery located at Whitegate, County Cork. All product is shipped (by road and by sea) ex tankage which is batched and fully tested by the refinery operator prior to release. A paper trail exists to trace any road tanker or ship's cargo back to a quality certificate for each manufactured batch.

Samples of fuel products (petrol and diesel) are taken at the refinery and at the following oil terminals by the Office of the Revenue Commissioners at a frequency of once per quarter (Dublin, Cork, Galway, Limerick, Waterford, New Ross and Rosslare) and after each top-up (i.e. new receipt) at the national oil reserves located at Bantry. Samples are analysed by the State Laboratory. Retail sites, road tankers, commercial vehicles etc. are sampled by the Office of the Revenue Commissioners to counter the evasion of excise duty.

In addition, individual oil companies test their products at home refinery and on receipt at terminals. A certificate of quality is available for inspection for each cargo/batch and product is tested again after discharge at terminals. Further quality spot checks are carried out at selected retail sites (between 2 – 4 times per annum, company dependant) to give quality traceability from refinery to end user.

In addition, the oil companies association (Irish Petroleum Industry Association) also arranged for its own independent sampling and testing of motor and gas oil. In 2007, such sampling and testing of motor and gas oil was undertaken for 23 forecourts and the Whitegate refinery in August 2007, and 23 forecourts and the Whitegate refinery in November and December 2007.

***Time/frequency of sampling:*** Monthly throughout the year.

***Specification of test methods:*** In accordance with the Directive.

***Collection of sales data:*** Sourced from the Department of Communications Marine and National Resources

### 15.2.2 Sampling and reporting

Ireland was not compliant with the sampling and reporting requirements in 2007, as all fuel grades should have been reported on given the percentage of sales they represent. The following Table 15.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 15.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 5 | RON 95 <50 ppm S | 5 | 68.0% | 41 | 75 | 100 | Yes | All of 18 | |
| 6 | RON 95 <10 ppm S | 5 | 32.0% | 0 | 0 | | | | |
| **P** | **Total Petrol** | | **100%** | **41** | **75** | **100** | **Yes** | **All of 18** | |
| 14 | Diesel <50 ppm S | 14 | 79.9% | 37 | 58 | 100 | Yes | All of 5 | |
| 15 | Diesel <10 ppm S | | 20.1% | 0 | 0 | | | | |
| **D** | **Total Diesel** | | **100%** | **37** | **58** | **100** | **Yes** | **All of 5** | |

**Notes:** S = Summer; W = Winter

### 15.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95***

*Detail:* One or more samples for RON, MON, Distillation at 100oC, Aromatics and Sulphur exceeded the limit values of the Directive. Values per parameter reached extremes of 94.4, 84.5, 43.2 %

(v/v), 59.1 mg/kg respectively.

*Statistical significance:* The tolerance limits for MON (84.5) and Aromatics (37.2 % v/v) were not exceeded and therefore these samples were compliant with the Directive.

Tolerance limits for RON (94.4), Distillation at 100oC (43.2 % v/v) and sulphur (59.1 mg/kg) were exceeded by 3, 1 and 1 sample respectively and therefore these samples were non-compliant with the Directive.

*Member State's notes:* *RON*: Department wrote to company in 2008 seeking an explanation.

Distillation at 100oC: Distillation @ 100 passes calc limits of 42.72% (v/v)

*Sulphur*: Department wrote to company 2008 seeking an explanation.

***Diesel***

There were no limiting value or tolerance limit exceedances in the diesel samples taken in 2007.

## 15.3 Temporal trends

Figure 15.2 to Figure 15.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. From 2001 to 2007, petrol sales increased by 20% and diesel sales increased by 45%.

**Figure 15.2: Temporal trends in national sales of petrol and diesel (million litres)**

**Figure 15.3: Temporal trends in national sales of low sulphur petrol (%)**

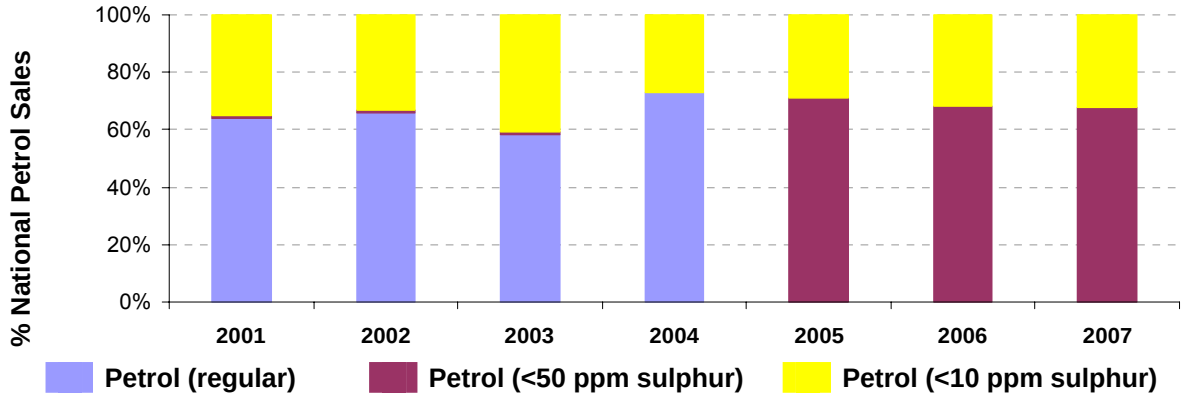



**Figure 15.4: Temporal trends in national sales of low sulphur diesel (%)**

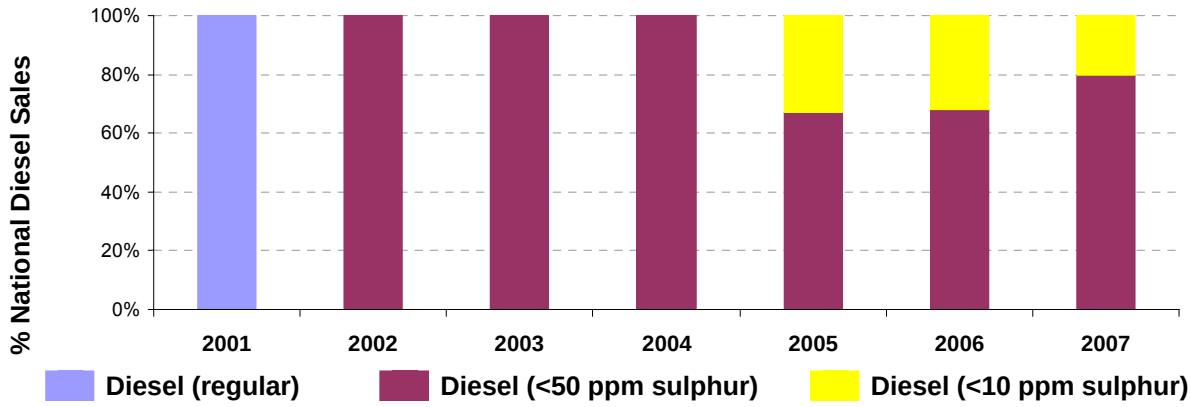
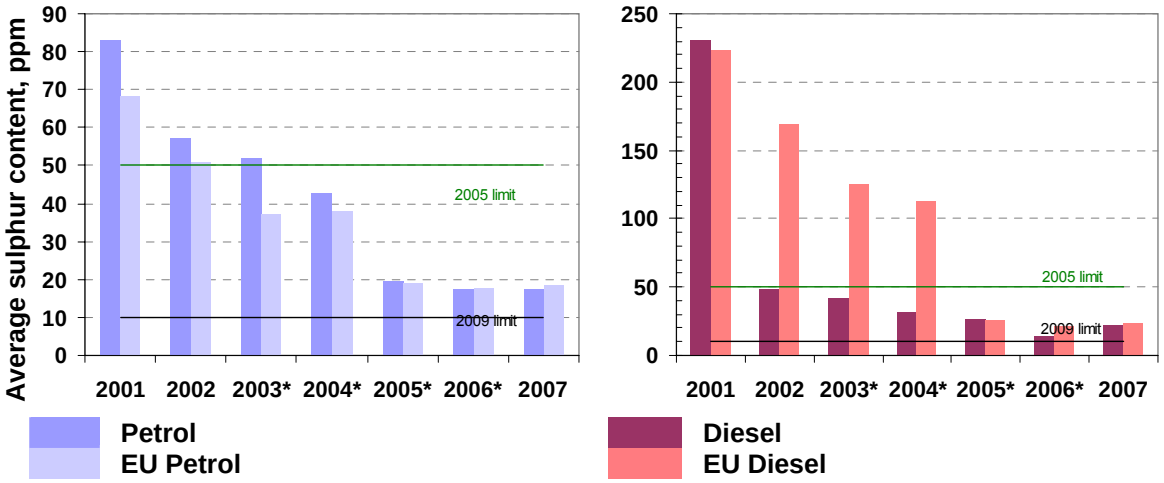



Figure 15.5 shows the trend in the average sulphur content of petrol and diesel fuels in Ireland compared with the EU average. The average sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm) and slightly below the EU average for petrol.

**Figure 15.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 15.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The report submission was received after the 30 June deadline – more than one month late.<br>• Sampling was conducted at refineries, depots and refuelling stations. Ireland should indicate whether the specific number of samples taken at refuelling stations matches the requirements of EN14274.<br>• In order to fully comply with the sampling requirements of FQMS Statistical Model C a minimum of 50 samples should be taken in each summer and winter period.<br>• Ireland has used FQMS Statistical Model C. As previously recommended, given the size of the country it is recommended that Ireland investigates whether Models A or B would be more appropriate. Ireland has indicated that preliminary assessments concluded that subdividing Ireland into sub-regions would not be particularly beneficial as the size of Ireland and relatively small number of fuel terminals means that a lot of product is crossing regional boundaries after leaving warehouse/refinery before retail sale. However, the model is set-up on the basis of retail station sampling rather than terminal locations so this may warrant further consideration.<br>• Comment: Following this preliminary assessment, Ireland is further examining the appropriateness of applying Model B or Model C sampling. Once this process has been completed, the preferred Model, appropriate to the circumstances in Ireland, will be applied.<br>• Following this preliminary assessment, Ireland is further examining the appropriateness of applying Model B or Model C sampling. Once this process has been completed, the preferred Model appropriate to the circumstances in Ireland will be applied. |

# 16 Italy

## 16.1 Fuel Availability 2007

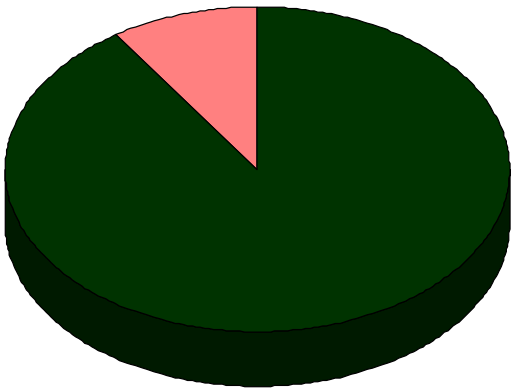
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

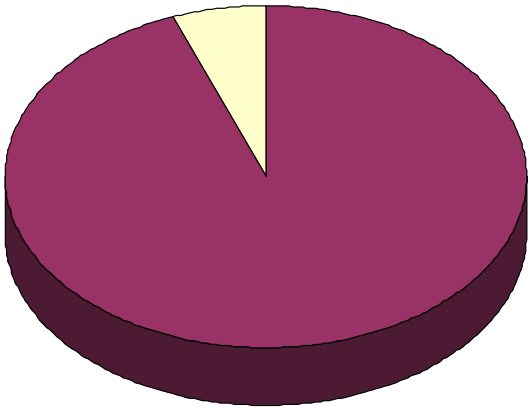
| Reference Number | Fuel grade | Sulphur Content | National fuel grade ID | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Unleaded Petrol minimum RON = 95 (≤ 50 ppm sulphur) | 5 |
| 6 | RON 95 | <10 ppm | Unleaded Petrol minimum RON = 95 & ≤ 10 ppm Sulphur | 6 |
| 14 | Diesel | <50 ppm | Diesel (≤ 50 ppm sulphur) | 14 |
| 15 | Diesel | <10 ppm | Diesel (≤ 10 ppm sulphur) | 15 |

### 16.1.1 Sales

**Figure 16.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 94.1% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 5.9% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 90.7% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 9.3% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 16.1 shows that all petrol sales were of RON 95 grade, with 90.7% low sulphur and 9.3% sulphur free (an increase from 8% in 2006).

Italy also reports that; “A limited quantity of petrol with minimum RON = 98 and maximum sulphur content of 10 mg/kg was sold in 2007 for market in trial, even if this does not correspond to any specific petrol grade defined at national level.”

### 16.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Italy has adopted for 2006, 2007 and 2008 the following minimal criteria to ensure an appropriate geographical availability of sulphur free fuels:

National level

- 10% refuelling stations with sulphur free petrol[1];
- 10% refuelling stations with sulphur free diesel[1];
- 15% refuelling stations with sulphur free petrol on motorway[1];
- 15% refuelling stations with sulphur free diesel on motorway[1];
- 300 km maximum distance between refuelling stations with sulphur free petrol on motorway;
- 300 km maximum distance between refuelling stations with sulphur free diesel on motorway.

NUTS 3 regional areas

- 2% refuelling stations with sulphur free petrol[1];
- 2% refuelling stations with sulphur free diesel[1].

In order to ensure compliance with the minimal criteria, the owners of refuelling stations submit to Ministry of Environment, Territory and Sea a plan in which refuelling stations with sulphur free fuels are located (separate for petrol and diesel fuel). Italy has also established the penalties applicable to breaches of the provisions contained in the plans. Italy presented the same 2006 tables for 2007 utilising a combination of options A, B and D of the Commission Recommendation.

The owners of refuelling stations have submitted plans relative to 2006 and on the whole, these plans have met the above-mentioned criteria. In 2007, there were no updates of the 2006 plans.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Sulphur-free fuels were marked at refuelling stations and were marketed separately.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since 2001, see Table 16.1.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 16.1: Annual trend in average sulphur content in petrol and diesel fuels**

| IT | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| **Fuel/Year** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2007** |
| ***Petrol*** | 61 | 51 | 53 | 53 | 25 | 20 | 14 | 18 |
| ***Diesel*** | 273 | 246 | 238 | 216 | 35 | 32 | 31 | 23 |

# 16.2 Fuel Quality Monitoring 2007

## 16.2.1 Description of system

***Responsible organisation(s):*** Ministry of Environment, Territory and Sea.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model A, with five macro regions.

***Country Size:*** Large (more than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** Monthly throughout the year.

***Specification of test methods:*** Italy established a fuel quality monitoring system in accordance with the Directive.

***Collection of sales data:*** Sales data are collected by Ministero delle Attività Produttive (Ministry of Industry) through an electronic questionnaire compiled by oil companies.

***Other details:*** The 2007 national report had been drawn up on the basis of a monitoring system at sale outlets distributed throughout the Italian territory. The monitoring system (sampling and measurements) was carried out by independent supervisory bodies on behalf of the main oil companies. Samples were taken monthly in each winter and summer period (summer period for petrol: 1st May to 30th September). 299 petrol samples and 382 diesel fuel samples were analysed in total.

The distribution of samples throughout the national territory was: 42% North-West, 12% North-East, 21% Centre, 13% South and 12% Islands. The test methods required for fuel quality monitoring were performed by laboratories that regularly participate in one or more national inter-laboratory proficiency testing schemes, and that are accredited according to EN ISO 17025 or certified according to ISO 9000 standards. The proficiency testing schemes include all test methods listed in the FQMS.

According to the requirements of EN 14274, analytical results for petrol and diesel fuel were reported separately for each season and for each grade. Compared to the total samples taken, the percentages of samples of sulphur free petrol and diesel fuel were 18% and 19%, respectively.

## 16.2.2 Sampling and reporting

Italy was mostly compliant with the sampling and reporting requirements in 2007. Table 16.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 16.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 90.7% | 144 | 100 | 200 | Yes | 13 of 18 | (2) |
| 6 | RON 95 <10 ppm S | 6 | 9.3% | 37 | 18 | 19 | Yes | 13 of 18 | (1)(2) |
| **P** | **Total Petrol** | | **100%** | **181** | **118** | **219** | | | |
| 14 | Diesel <50 ppm S | 14 | 94.1% | 164 | 146 | 200 | Yes | 5 of 5 | (1) |
| 15 | Diesel <10 ppm S | 15 | 5.9% | 47 | 25 | 12 | Yes | 5 of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **211** | **171** | **212** | | | |

**Notes:** S = Summer; W = Winter
(1) Sulphur non-compliance present over <10ppm limit value, but within <50ppm limit value.
(2) Member state comments: Test method EN 1601 was employed for the determination of oxygenate content in petrol samples. EN 1601 requires the examination of each sample chromatogram to identify possible oxygen containing components, before the actual determination is carried out. The examination of all chromatograms related to FQMS samples showed that only one oxygenate compound was present in each sample (MTBE, ETBE, TAME). No other oxygenate compound was detected beside one of these ethers.

### 16.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95 low sulphur (<50ppm)***

*Detail:* The limiting values for RON (minimum RON 95) MON (minimum 85), summer Vapour Pressure (maximum 60 kPa) and Distillation at $100^0$C (minimum 46 % (v/v) were exceeded by one or more samples.

*Statistical significance:* The tolerance limits for the test methods are 94.6 for RON and 84.5 for MON and so 3 samples giving values of 93.4, 94.1 (RON) and 84.3 (MON) were non-compliant with the Directive.

The tolerance limits for statistical significance for summer Vapour pressure (61.8 kPa) was exceeded by 3 samples giving values of 62.7, 62.5 and 62.5 kPa were non- compliant with the Directive.

*Member State's notes:* In order to ensure the compliance with the Directive, Italy determined the penalties applicable to producers, importers and distributors of fuels that do not comply with the limits reported in the Directive.

Furthermore, Italy established a monitoring system carried out by a competent national authority in the production and importing sites.

***Petrol RON 95 sulphur free (<10ppm)***

*Detail:* One or more samples exceeded the limiting values for summer Vapour Pressure (60kPa), Aromatics (35 % (v/v), Oxygen content (2.5 % (m/m) and Ethers (15 % (v/v).

| | |
|---|---|
| *Statistical significance:* | Tolerance limits for summer Vapour Pressure (61.8 kPa), Oxygen content (2.9 % (m/m) and Ethers (15.6 % (v/v) were all non-compliant with the Directive, giving values of 64.7, 36.4, 3.0 and 16.6, respectively.<br><br>The other samples that exceeded the Aromatics limit value, were within the zone of tolerance and were therefore compliant with the Directive. |
| *Member State's notes:* | As above. |

**Additional notes:** The sulphur limiting value of 10ppm was exceeded by two samples. The Tolerance limit (11.8ppm) was exceeded by one of those samples giving a value of 12.6ppm, the other sample (11ppm) was in accordance with the Directive as it is within tolerance limits.

***Low sulphur diesel (<50ppm)***

| | |
|---|---|
| *Detail:* | In one or more samples, the cetane numbers were below the minimum limit value of 51. Some samples exceeded the limit values for distillation 95%-point (360$^{o}$C) and sulphur content (50 ppm) with maximum values of 372.7, 366.4, 366.2 and 367.2 (Distillation) and 65.1 respectively. |
| *Statistical significance:* | The tolerance limits for cetane (48.5) were not exceeded and therefore the sample was in compliance with the Directive.<br><br>Tolerance limits for distillation (365.9$^{o}$C) and sulphur content (54.7 ppm) were exceeded and therefore the 5 samples were non-compliant with the Directive. |
| *Member State's notes:* | As above. |

***Sulphur free diesel (<10ppm)***

| | |
|---|---|
| *Detail:* | In one or more samples, the cetane numbers were below the minimum limit value of 51. One or more samples also exceeded the limit values for distillation 95%-point (360$^{o}$C. |
| *Statistical significance:* | The tolerance limits for cetane (48.5) and distillation (365.9$^{o}$C) were not exceeded and therefore all samples were in compliance with the Directive. |

## 16.3 Temporal trends

Figure 16.2 to Figure 16.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. From 2005 onwards, there has been a complete switch to low and no sulphur fuel grades.

**Figure 16.2: Temporal trends in national sales of petrol and diesel (million litres)**

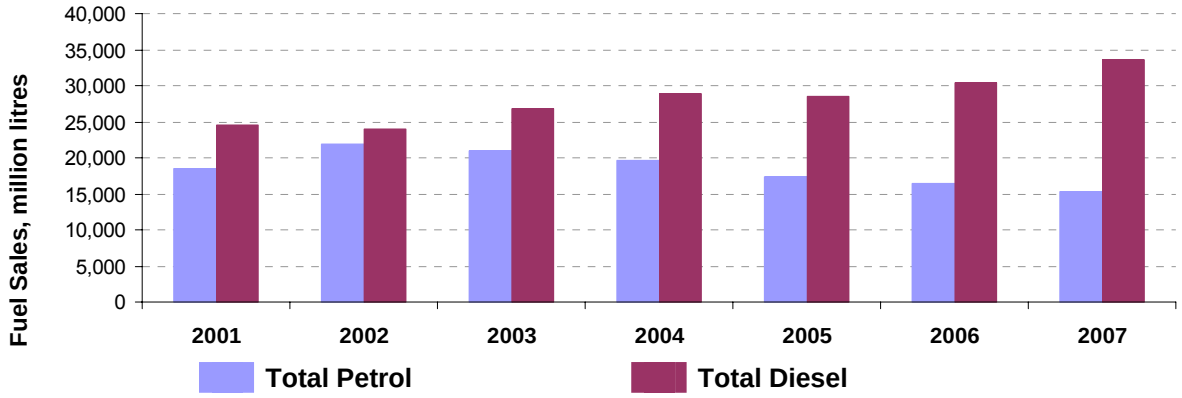



Figure 16.3: Temporal trends in national sales of low sulphur petrol (%)

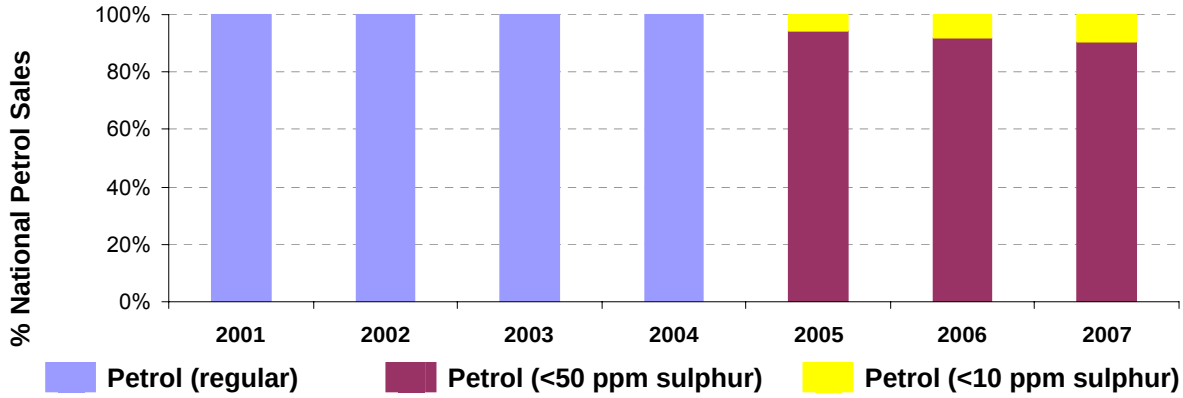



**Figure 16.4: Temporal trends in national sales of low sulphur diesel (%)**

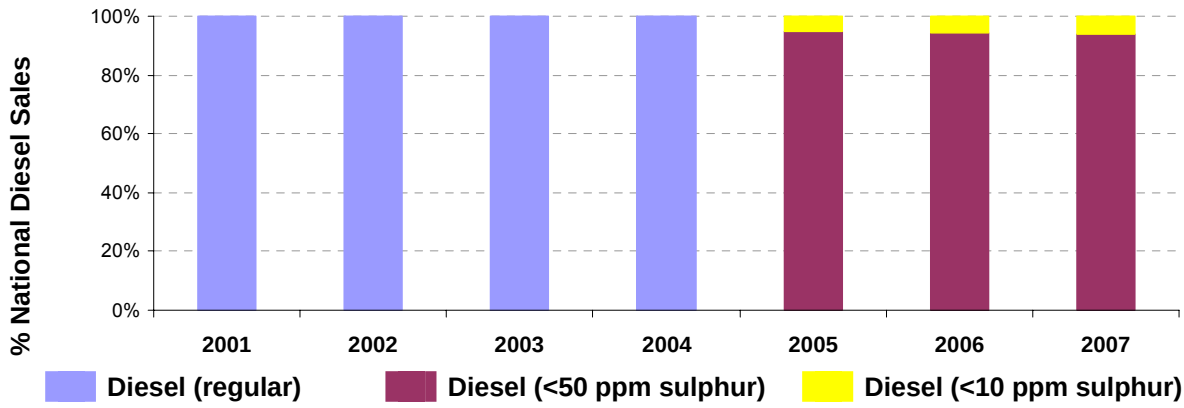
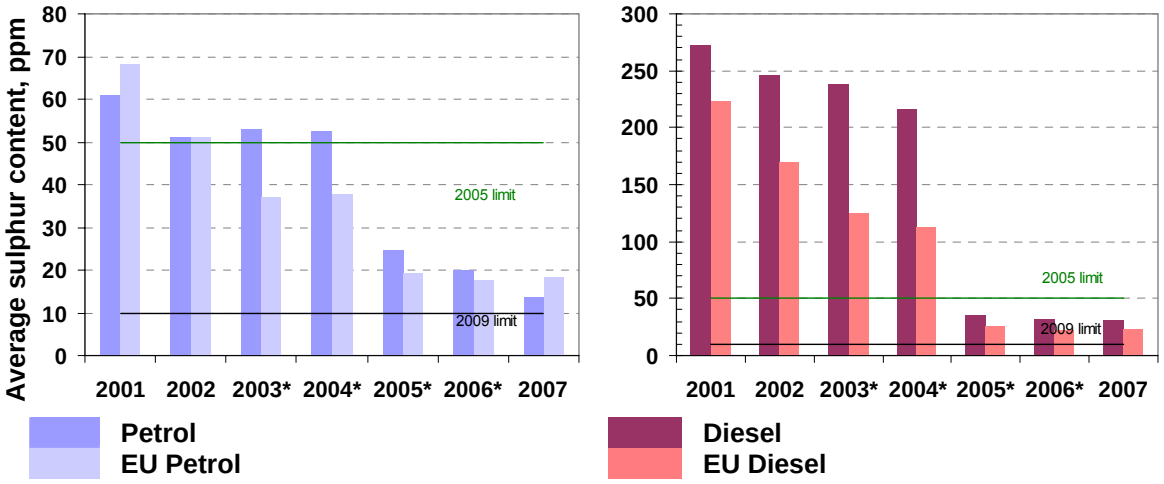



Figure 16.5 shows the trend in the average sulphur content of petrol and diesel fuels in Italy compared with the EU average. The average sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm). Additionally the average sulphur content for petrol was below the EU average but for diesel was above the EU average.

**Figure 16.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 16.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Italy was essentially fully compliant with the requirements of the directive. The only area for continuous improvement is in the reduction of fuel quality non-compliances highlighted in fuel sample analysis (although these appear to currently be low). |

# 17 Latvia

## 17.1 Fuel Availability 2007

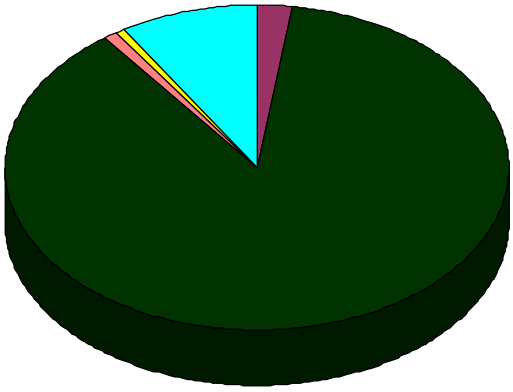
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

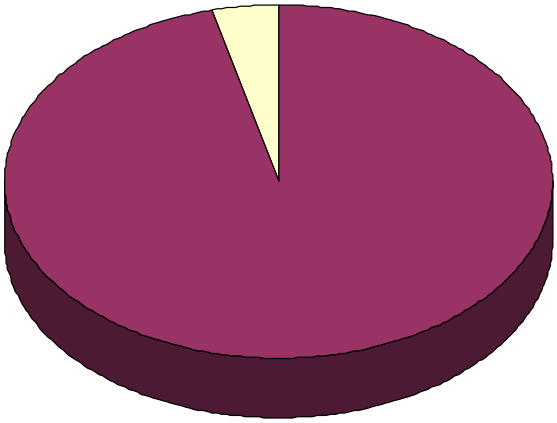
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 2 | RON 91 | <50 ppm | A-92 | 2 |
| 5 | RON 95 | <50 ppm | A-95 | 5 |
| 6 | RON 95 | <10 ppm | Petrol 95 | 5 |
| 11 | RON 98 | <50 ppm | A-98 | 11 |
| 12 | RON 98 | <10 ppm | Petrol 98 | 11 |
| 14 | Diesel | <50 ppm | DD | 14 |
| 15 | Diesel | <10 ppm | Diesel fuel | 15 |

### 17.1.1 Sales

**Figure 17.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 2.3% | 14 | Diesel (<50 ppm sulphur) | 96.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 4.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 87.5% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 0.7% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 0.6% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 8.9% | | | |

Figure 17.1 shows that in the 2007 reporting period there were low sulphur and sulphur-free fuel grades available in Latvia. RON 95 petrol comprised the vast majority of sales whilst sales of RON 91 fuels have fallen from 5.1% to 2.3% of total petrol sales. Sulphur free fuel is now available in Latvia, comprising 0.7% and 8.9% of RON 95 and RON 98 sales respectively. Sulphur-free diesel sales have increased from 0.04% in 2006 4% in 2007. It is worth noting that diesel used for non-road purposes was sold in Latvia in 2007 for use in the farming, forestry and fishing sectors but does not fall within the scope of Directive 98/70/EC.

### 17.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Fuel retailers that own at least 30 filling stations shall ensure petrol and diesel fuel complying with the surphur-free fuels is available in at least one filling station of these undertakings which are located near any of the main State roads for the service of transport flow.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No

**Are the sample analysis results for sulphur content of sulphur-free grades reported separately?** No

***Average sulphur content of all petrol and diesel sold:*** Table 17.1 shows the average content of fuel sold in relation to the EU27 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 17.1: Annual trend in average sulphur content in petrol and diesel fuels**

| LV | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 66 | 25 | 11 | 23 | 18 |
| *Diesel* | | | | 329 | 21 | 16 | 33 | 23 |

## 17.2 Fuel Quality Monitoring 2007

### 17.2.1 Description of system

***Responsible organisation(s):*** Ministry of Economics

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions)

***Location(s) of sampling:*** Refuelling stations, terminals and refineries.

***Time/frequency of sampling:*** Monthly throughout the year, samples not taken for RON 91 fuel in March, April, September and October and for sulphur free diesel samples were taken in 5 months of the year (February, May, July, September and October).

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** In accordance with Latvian law and regulations, the State Revenue Service (SRS) is responsible for monitoring of the fuel market. SRS Excise Goods

Department is a structural unit of the SRS central apparatus whose main function is to ensure that laws and regulations concerning circulation of excise goods are being implemented.

***Other details:*** In order to ensure effective monitoring of fuel quality, SRS began to use mobile express laboratories of fuel quality testing in February 2004. With these express laboratories, fuel quality testing is carried out in all stages of fuel circulation, covering as many licensed entrepreneurs as possible. As only licensed entrepreneurs are allowed to trade with fuel, approximately 1,500 samples are tested each year.

The use of express laboratories has reduced the time spent between the moment of sample taking and receiving the conclusion of conformity assessment. This is important both in terms of consumer protection (so no inadequate fuel would be in circulation) and interests of entrepreneurs themselves (so any distraction of entrepreneurs' activity would be as short as possible).

Latvian reporting also includes analysis of fuel for non-road use, however the Directive only features analysis of those samples from road fuels (both diesel and petrol).

### 17.2.2 Sampling and reporting

Latvia was essentially compliant with the sampling and reporting requirements in 2007, however Latvia has not provided information on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274. Latvia has also reported on fuel quality analysis including non-road fuels, which are not required under Directive EN 14274. The following Table 17.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 17.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported Under Category | % Sales | Samples | | | Separate S&W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 2 | RON 91 <50ppm S | 2 | 2.3% | 56 | 57 | - | Yes | All of 18 | (1) |
| 5 | RON 95 <50 ppm S | 5 | 87.5% | 184 | 207 | - | Yes | All of 18 | (1) |
| 6 | RON 95 <10 ppm S | 5 | 0.7% | 0 | 0 | - | | | |
| 11 | RON 98 <50 ppm S | 11 | 0.6% | 95 | 106 | - | Yes | All of 18 | (1) |
| 12 | RON 98 <10 ppm S | 11 | 8.9% | 0 | 0 | - | | | |
| **P** | **Total Petrol** | | **100%** | **335** | **370** | **-** | **Yes** | **All of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 96.0% | 347 | 534 | - | Yes | All of 5 | (1) |
| 15 | Diesel <10 ppm S | 15 | 4.0% | 1 | 6 | - | Yes | All of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **348** | **540** | **-** | **Yes** | **All of 5** | **(2)** |

**Notes:** S = Summer; W = Winter
(1) No detail has been provided on the number of non-compliant road-fuel samples and the values with which they are non-compliant.

### 17.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 91 Petrol***

*Detail:* The maximum Limiting Value for Aromatics of 35 % (v/v) was exceeded by at least one sample.

| | |
|---|---|
| *Statistical significance:* | The maximum Tolerance Limit for Aromatics is 37.2 % (v/v), at least one sample exceeded this limit with a value of 40 % (v/v) and so was non-compliant with the Directive. |
| *Member State's notes:* | - |

***RON 95 Petrol***

| | |
|---|---|
| *Detail:* | The maximum Limiting Value for Aromatics of 35 % (v/v) was exceeded by at least one sample with a value of 36.5 % (v/v). |
| *Statistical significance:* | The maximum Tolerance Limit for Aromatics is 37.2 % (v/v) and so the sample was compliant with the Directive. |
| *Member State's notes:* | - |

***RON 98 Petrol***

| | |
|---|---|
| *Detail:* | The maximum Limiting Value for Aromatics of 35 % (v/v) was exceeded by at least one sample with a value of 37.6 % (v/v). |
| *Statistical significance:* | The maximum Tolerance Limit for Aromatics is 37.2 % (v/v); at least one sample exceeded this limit with a value of 37.6 % (v/v) and so was non-compliant with the Directive. |
| *Member State's notes:* | - |

***Diesel < 50ppm***

| | |
|---|---|
| *Detail:* | Cetane number and sulphur content limit values (of min. 51 and max. 50 ppm respectively) were exceeded with extremes of 48.4 and 334 ppm for each parameter. |
| *Statistical significance:* | The tolerance limits for statistical significance for cetane (minimum 48.5) was not exceeded and so the samples was compliant with the Directive.<br>The Tolerance Limit for Sulphur content is a maximum 54.7ppm. This sample was therefore non-compliant with the Directive. |
| *Member State's notes:* | - |

***Diesel < 10ppm***

| | |
|---|---|
| *Detail:* | Cetane number limit value (min. 51) was exceeded by at least one sample with a value of 49.3. |
| *Statistical significance:* | The tolerance limits for statistical significance for Cetane is 48.5 and so the sample was compliant with the Directive. |
| *Member State's notes:* | - |

## 17.3 Temporal trends

The following Figure 17.2 to Figure 17.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Both petrol and diesel sales have increased from since 2006.

**Figure 17.2: Temporal trends in national sales of petrol and diesel (million litres)**

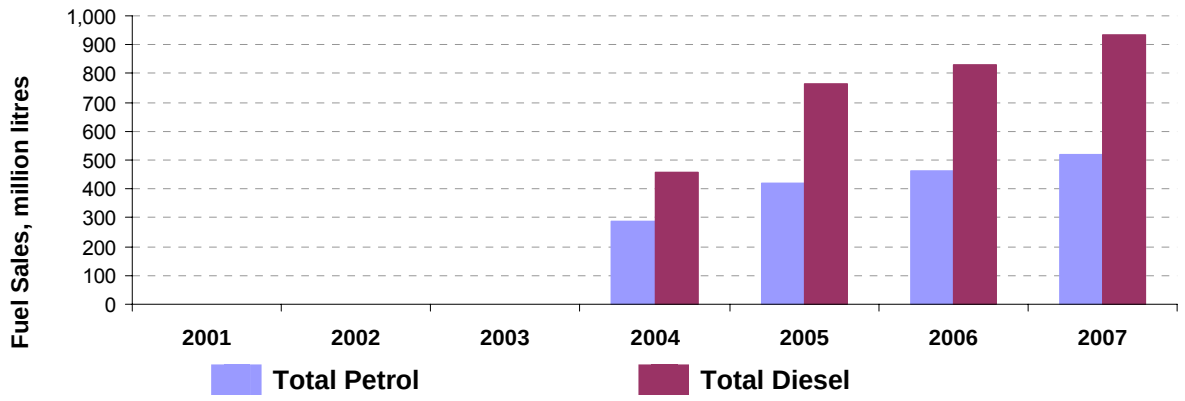



**Figure 17.3: Temporal trends in national sales of low sulphur petrol (%)**

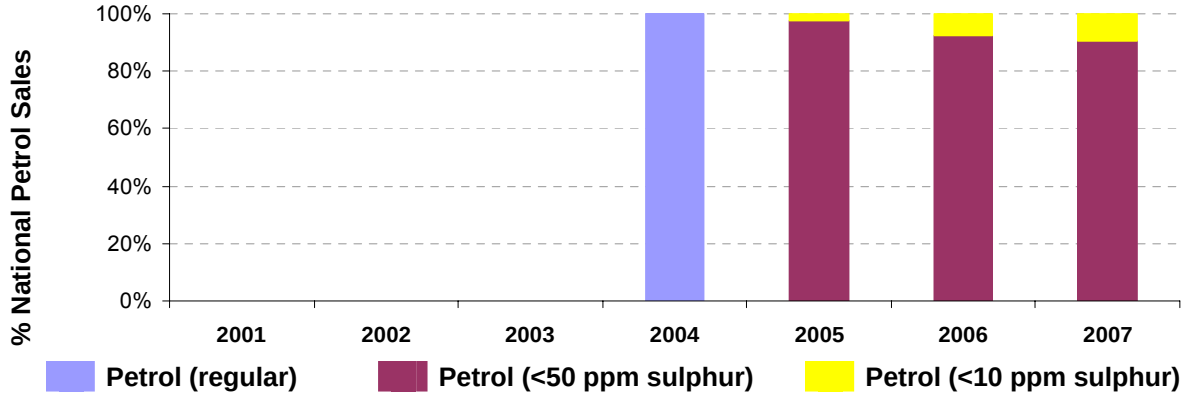



**Figure 17.4: Temporal trends in national sales of low sulphur diesel (%)**

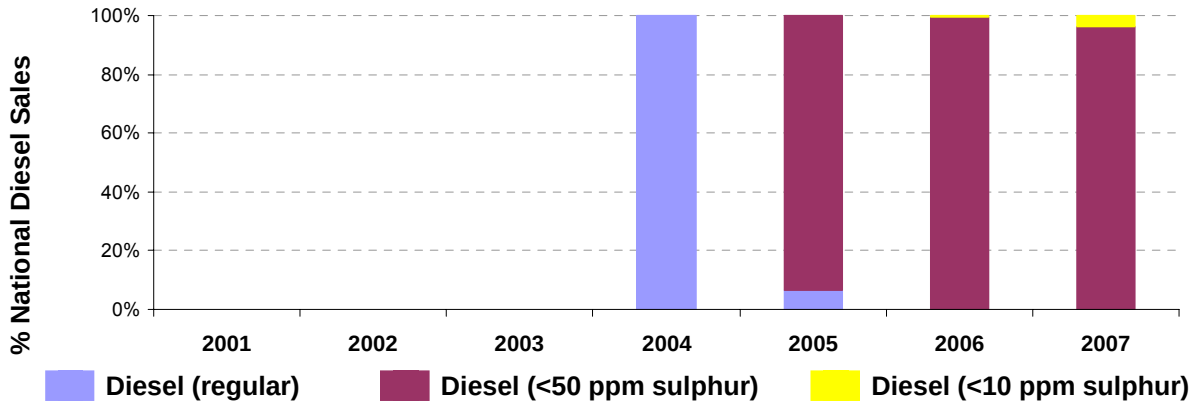
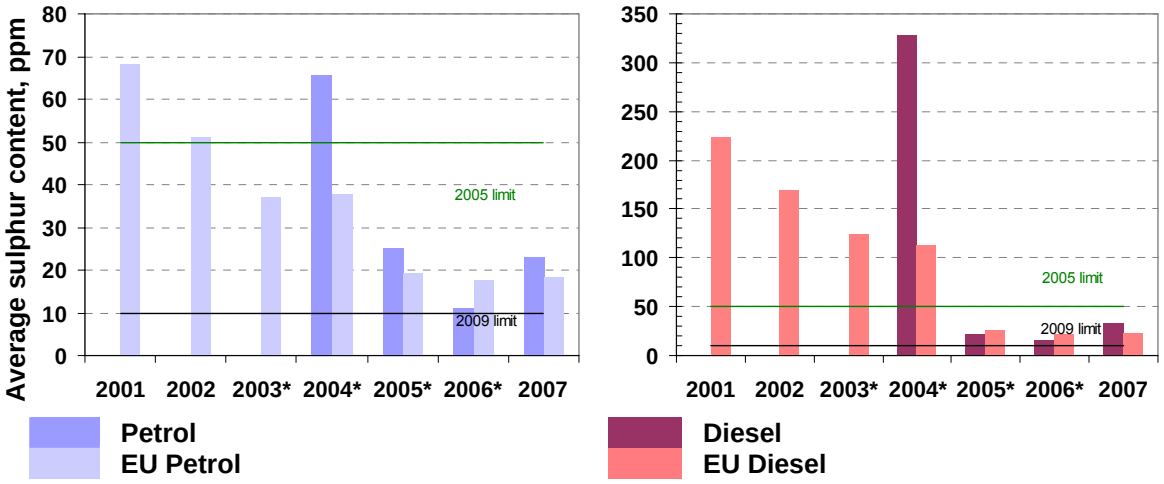



Figure 17.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average. The average sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm) but above the EU average.

**Figure 17.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 17.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Latvia has not provided an explanation for utilising a national FQMS in place of the European Standard or its statistical equivalence to the standard. A large number of samples were taken, but these were from refuelling stations, terminals and refineries and Latvia should therefore specify how many samples were taken from refuelling stations.<br>• Latvia has also reported on the quality of non-road fuels in combination with road fuel analysis reporting, which is outwith the remit of Directive reporting requirements. Latvia should report on road quality fuel sales, distribution, analysis and non-compliances separately.<br>• Sulphur free fuels are not marked separately from regular grades, preventing consumers from choosing these fuels if required by their vehicle. |

# 18 Lithuania

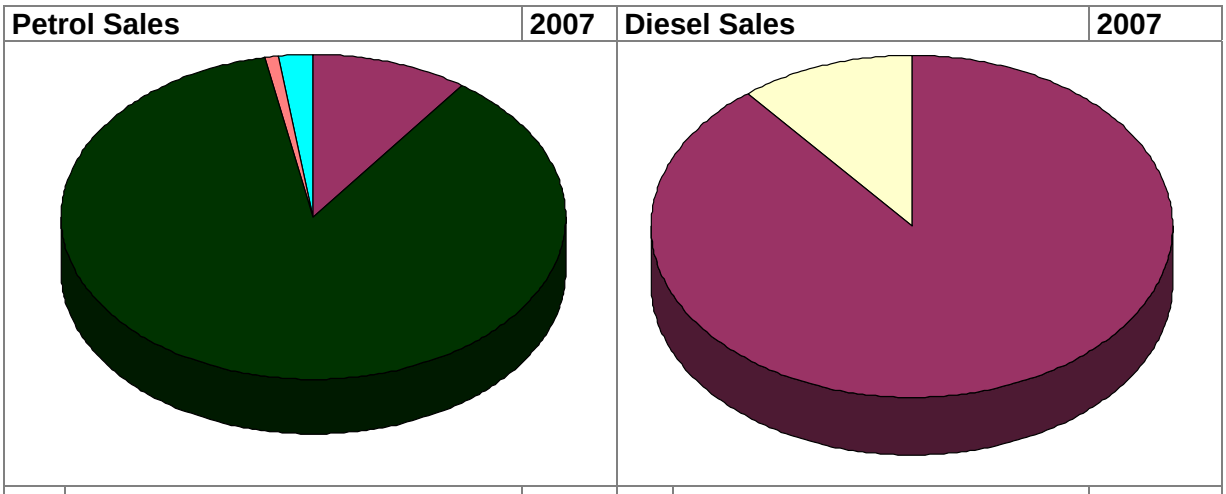
## 18.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 2 | RON 91 | <50 ppm | A-92 (RON 92) | 2 |
| 5 | RON 95 | <50 ppm | A-95 (RON 95) | 5 |
| 6 | RON 95 | <10 ppm | A-95 (RON 95) | 6 |
| 12 | RON 98 | <10 ppm | A-98 (RON 98) | 12 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel | 15 |

### 18.1.1 Sales

**Figure 18.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 10.0% | 14 | Diesel (<50 ppm sulphur) | 89.2% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 10.8% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 86.9% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 0.9% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 2.2% | | | |

Figure 18.1 shows that the majority of fuel sold in 2007 was RON 95 (<50ppm) grade (86.9%), with RON 91 fuels comprising 10% of sales. Only small amounts of sulphur-free

petrol (0.9%) and sulphur-free diesel (10.8%) were sold – a reduction on the sales of sulphur free fuels since 2006.

### 18.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur-free petrol and diesel is marketed all over the national territory in around 20 refuelling stations.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes

***Average sulphur content of all petrol and diesel sold:*** Table 18.1 shows the average content of fuel sold in relation to the EU25 average. Sulphur content for both petrol and diesel have risen slightly on reported averages in 2006.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 18.1: Annual trend in average sulphur content in petrol and diesel fuels**

| LT | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 39 | 21 | 24 | 27 | 18 |
| *Diesel* | | | | 104 | 29 | 25 | 29 | 23 |

## 18.2 Fuel Quality Monitoring 2007

### 18.2.1 Description of system

***Responsible organisation(s):*** State Non Food Products Inspectorate under the Ministry of Economy is responsible for fuel quality sampling and analysis. The Ministry of Environment is responsible for reporting under the Directive 98/70/EC.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September, although the national limit for vapour pressure is 70kPa implying a period of 1st June to 31st August (arctic or severe weather conditions).

***Location(s) of sampling:*** Sampling is carried out at terminals, refuelling stations and end user storage tanks. Monitoring programme covers all of Lithuania's territory.

***Time/frequency of sampling:*** Lithuania states that samples are taken monthly across the year; however, no samples were taken for any fuel grade (petrol and diesel) in October and November. Additionally, national fuel grade A-92 (RON 92) was not sampled in January, March and April, grade A-95 (RON 95), was not sampled in March and April. No samples were tested for petrol grade A-95 (RON 95) from March to August and fuel grade A-98 (RON 98) was not sampled March to July. In addition Low sulphur diesel was not sampled in January to April and Sulphur free diesel fuel was not sampled from March to September.

All mandatory petrol and diesel parameters are measured. Other petrol parameters measured: density at 15°C, % evaporated at 70°C, final boiling point, distillation residue,

vapour lock index. Other diesel parameters measured: distillation % recovered at 250°C/ at 350°C, cold filter plugging point (CFPP), cloud point, viscosity at 40°C, flash point.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** No information provided.

### 18.2.2 Sampling and reporting

Lithuania did not take a sufficient number of samples for each fuel grade in each summer and winter period (counting <50ppm and <10ppm grades separately), but was compliant with other aspects of reporting in 2007. The following Table 18.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 18.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 2 | RON 91 <50ppm S | 2 | 10.0% | 8 | 7 | 10 | Yes | All of 18 | **(3)** |
| 5 | RON 95 <50 ppm S | 5 | 86.9% | 47 | 41 | 100 | Yes | All of 18 | **(3)** |
| 6 | RON 95 <10 ppm S | 6 | 0.9% | 3 | 31 | 1 | Yes | All of 18 | **(3)** |
| 12 | RON 98 <10 ppm S | 12 | 2.2% | 4 | 6 | 3 | Yes | All of 18 | **(1)(3)** |
| **P** | **Total Petrol** | | **100%** | **62** | **85** | **114** | | | |
| 14 | Diesel <50 ppm S | 14 | 89.2% | 50 | 2 | 100 | Yes | All of 5 | **(3)** |
| 15 | Diesel <10 ppm S | 15 | 10.8% | 0 | 48 | 100 | No | All of 5 | **(3)** |
| **D** | **Total Diesel** | | **100%** | **50** | **50** | **200** | **No** | All of 5 | **(2)(3)** |

**Notes:** S = Summer; W = Winter

(1) Petrol Grades RON 95 (<50ppm) and RON 95 (<10ppm) reported separately for summer and winter, however results have been combined in the Full Year analysis. Petrol Grades RON 91 (<50ppm) and RON 98 (<10ppm) all results reported entirely separately

(2) Sulphur free diesel – only winter results given, low sulphur diesel summer and winter results reported separately. Full year results combined low sulphur (<50ppm) diesel and sulphur free (<10ppm) diesel

(3) Numbers of non-compliant samples not provided

### 18.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 92 Petrol***

*Detail:* RON (92.1) and MON (82) were both below the minimum Limiting Values of 95 and 85, respectively. At least one Olefins sample of 18.1 % (v/v) exceeded the maximum value of 18 % (v/v)

*Statistical significance:* RON (92.1), MON (82) and Olefins 18.1 % (v/v) values were all within the tolerance limits for the test method, 90.6, 80.5 and 5.1 % (v/v) respectively and were therefore compliant.

***RON 95 Petrol <50ppm***

All samples tested were in compliance with limit values.

***RON 95 Petrol <10ppm***

All samples tested were in compliance with limit values.

***RON 98 Petrol***

| | |
|---|---|
| *Detail:* | The values of RON (98) and MON (88) were below the minimum limit value for some samples. |
| *Statistical significance:* | RON (98) and MON (88) were within the tolerance limits for the test method 90.6 and 80.5 respectively and were therefore compliant. |

***Diesel <50 ppm***

All samples tested were in compliance with limit values.

***Diesel <10 ppm***

All samples tested were in compliance with limit values.

## 18.3 Temporal trends

The following Figure 18.2 to Figure 18.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Both petrol and diesel sales increased from 2004 to 2007 by 76% and 45% respectively. Sales of sulphur free petrol (<10ppm) have increased significantly since 2004, although sales of sulphur free diesel have decreased by 13% in the same period.

**Figure 18.2: Temporal trends in national sales of petrol and diesel (million litres)**

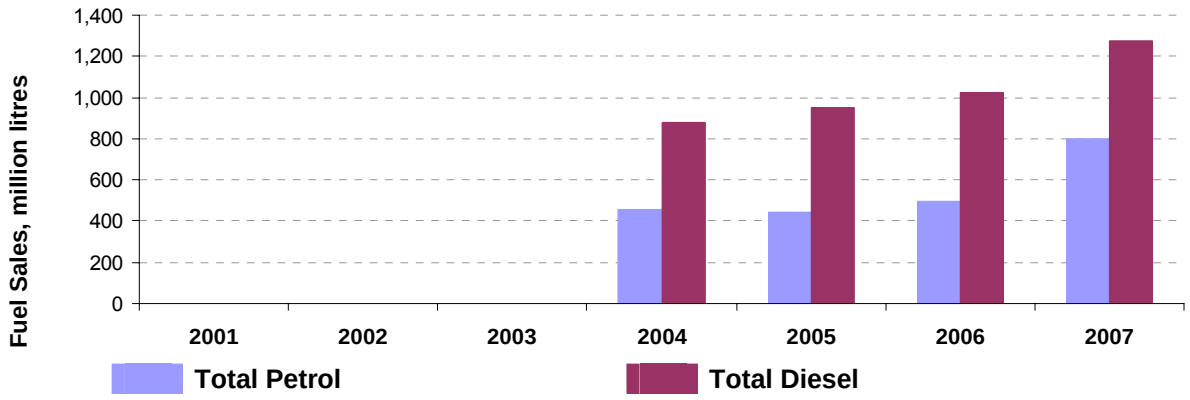



**Figure 18.3: Temporal trends in national sales of low sulphur petrol (%)**

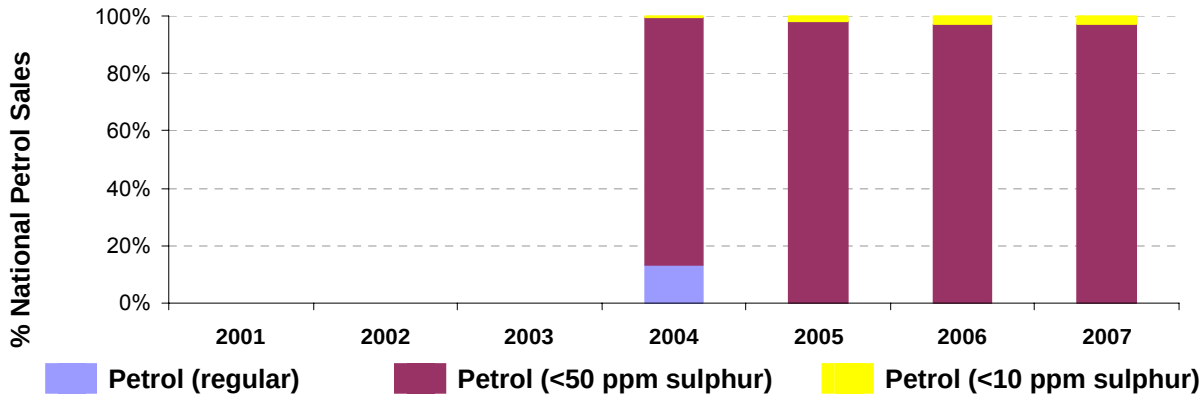


**Figure 18.4: Temporal trends in national sales of low sulphur diesel (%)**

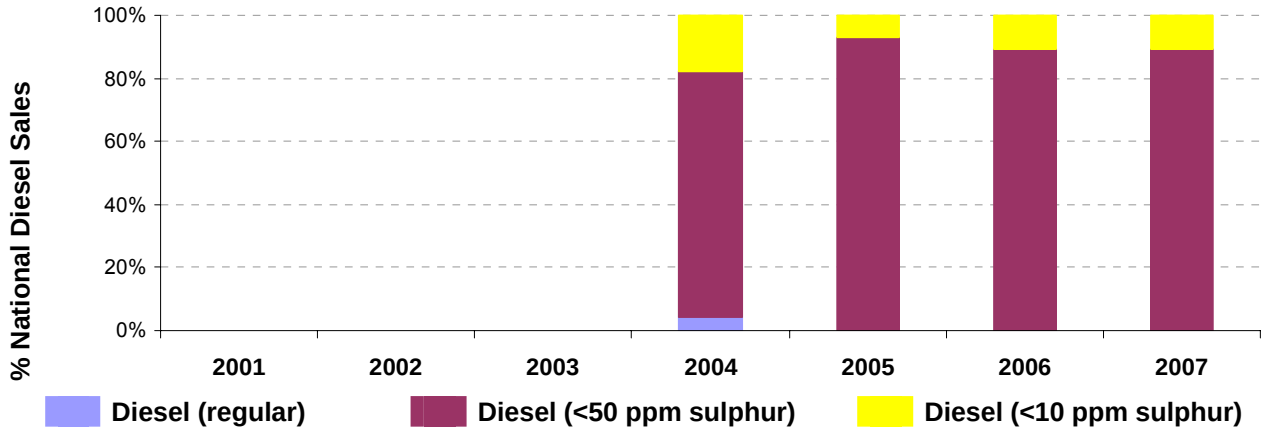
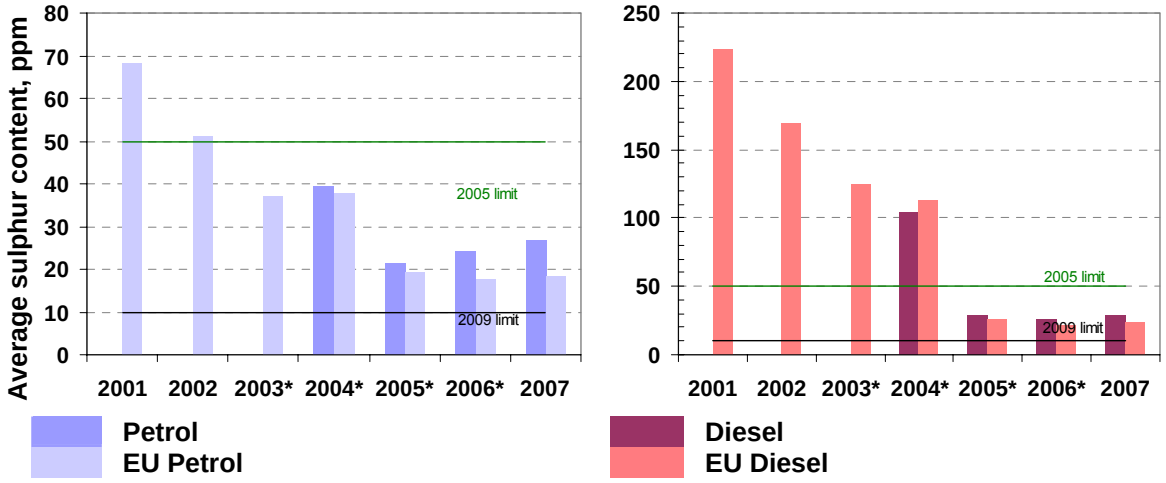



Figure 18.5 shows the trend in the average sulphur content of petrol and diesel fuels for Lithuania compared with the EU average. The average sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm) but above the EU average.

**Figure 18.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 18.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Lithuania is not taking sufficient samples to comply fully with Statistical Model C for all fuels (only when counting <50ppm and <10ppm grades separately), in each summer and winter period and no sampling was carried out for Sulphur free diesel in winter.<br>• Lithuania has reported summer and winter sampling results for A-95 (RON 95), Low sulphur and sulphur free, however has given Full Year results for the sampling which combines the two fuel grades. Full year results could have been reported separately.<br>• Lithuania has combined the full-year sampling results for diesel grades; this could have been reported separately. |

# 19 Luxembourg

**Luxembourg has not submitted a Fuel Quality Monitoring report for reporting year 2007.**

# 20 Malta

## 20.1 Fuel Availability 2007

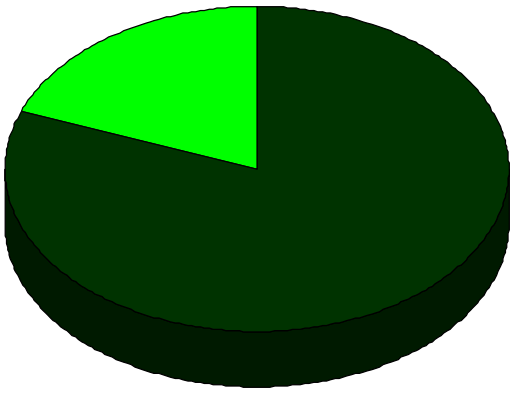
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported. No report was received from Malta for reporting year 2006.

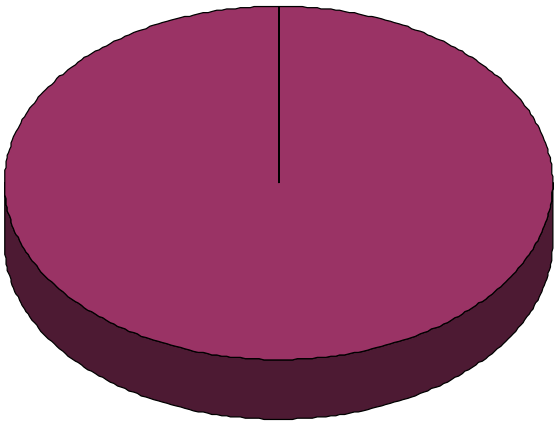
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Unleaded petrol | 5 |
| 8 | 95<RON <98 | <50 ppm | Lead Replacement Petrol (LRP) | 8 |
| 14 | Diesel | <50 ppm | Diesel | 14 |

### 20.1.1 Sales

**Figure 20.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 81.0% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 19.0% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 21.1 shows that all petrol sold in Malta in 2007 was low-sulphur – with no sulphur free fuel grades available (petrol or diesel). No report was received from Malta in reporting year 2006.

### 20.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Malta has not reported sales of any sulphur free fuels.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Not applicable.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Only low suplhur grades have been sampled and reported on for 2007.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since Malta first submitted a report for 2004. Malta did not submit a Fuel Quality Monitoring Report for 2006, see Table 21.1. No sulphur-free fuel availability has been reported in Malta for 2007.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 20.1: Annual trend in average sulphur content in petrol and diesel fuels**

| MT | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 78 | 37 | No data | 34 | 18 |
| *Diesel* | | | | 322 | 114 | No data | 47 | 23 |

## 20.2 Fuel Quality Monitoring 2007

### 20.2.1 Description of system

***Responsible organisation(s):*** Malta Environment & Planning Authority - Environment Protection Directorate

***Format of Fuel Quality Monitoring System (FQMS):*** National Model.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations and terminals

***Time/frequency of sampling:*** Sampling was carried out in both summer and winter periods for all fuel grades and types.

***Specification of test methods:*** Most of the sampling was carried out as specified in Directive 98/70/EC.

***Collection of sales data:*** No information provided.

***Other details:*** Enemalta Corporation was the sole importer of petrol and diesel fuels for use in Malta in 2006. Deliveries are made periodically by ship to the Enemalta terminal. Each fuel consignment is accompanied by a quality certificate issued by a recognized fuel analysis organization. For every shipment, a sample is also taken and analysed by a separate independent analytical laboratory. Malta currently has more than 80 service stations which have been geographically divided into four districts. On a regular basis, a randomly selected refuelling station from one district is sampled for each fuel type available and the necessary

analytical testing carried out by an independent analytical laboratory. This system ensures full coverage of road\transport fuels used in Maltese territory. Based on fuel sales for the year 2007, the overall samples to sales ratio for the year corresponds to: 261 samples per billion litres of unleaded petrol, 444 samples per billion litres of LRP and 154 samples per billion litres of diesel.

### 20.2.2 Sampling and reporting

Malta was partially compliant in 2007 with the sampling and reporting requirements. However, insufficient samples for all fuel grades were taken. Malta's 2007 report was submitted 11 months late and did not provide details of their National Fuel Quality Monitoring System to provide comparison with the systems as specified in the Directive. Malta has not provided information about sales data collection. The following Table 21.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 20.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 5 | RON 95 <50 ppm S | 5 | 81.0% | 9 | 11 | - | Yes | All of 18 | (1) |
| 8 | 95<RON<98 <50 ppm S | 8 | 19.0% | 4 | 4 | - | Yes | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **0** | **0** | **-** | | | |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 7 | 10 | - | Yes | All of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **0** | **0** | **-** | | | |

**Notes:** S = Summer; W = Winter

(1) All non-compliance for RON found on the market – not within shipped in fuels (indicates contamination post distribution)

(2) Cetane index (ASTM D976) is reported instead of cetane number. Density at 15oC tested using ASTM D4052. Sulphur content tested using ASTM D2622.

### 20.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* Three samples exceeded the limiting value for RON with values of less than 95.

*Statistical significance:* The Tolerance Limit for RON is 94.6 (minimum) and so three samples giving values of 94.2, 94.2 and 94.4 were non-compliant with the Directive.

*Member States Notes:* All non-compliance for RON found on the market – not within shipped in fuels samples.

***RON 98 Petrol***

None.

***Diesel***

*Detail:* Three samples exceeded the limiting value for sulphur of 50 mg/kg;

| | |
|---|---|
| | samples were tested using method ASTM D2622. |
| *Statistical significance:* | Samples with values for sulphur content of 65 mg/kg, 62 mg/kg and 59 mg/kg were non-compliant with the Directive. |
| *Member States Notes:* | All non-compliances were found in samples from the market. |

## 20.3 Temporal trends

Figure 21.2 to Figure 21.4 show the trend in total fuel sales and low sulphur fuel (<50 ppm) sales as a proportion of total sales. Malta has reported only sales of low sulphur fuels and did not report on 2006 fuel quality.

**Figure 20.2: Temporal trends in national sales of petrol and diesel (million litres)**

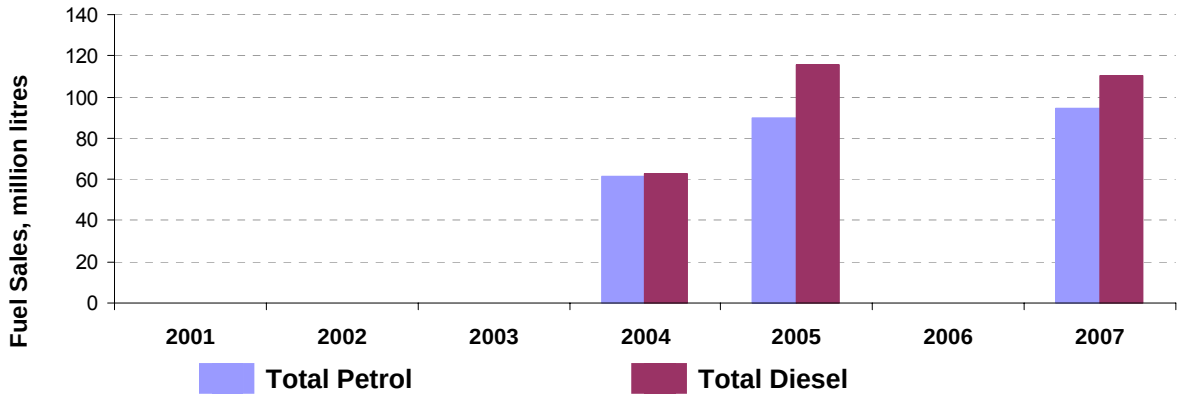



**Figure 20.3: Temporal trends in national sales of low sulphur petrol (%)**

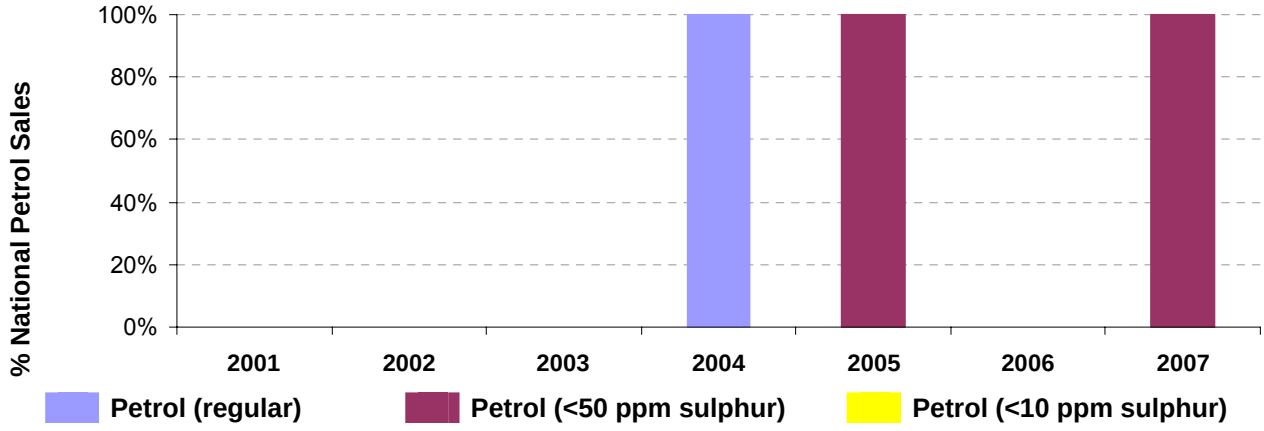



**Figure 20.4: Temporal trends in national sales of low sulphur diesel (%)**

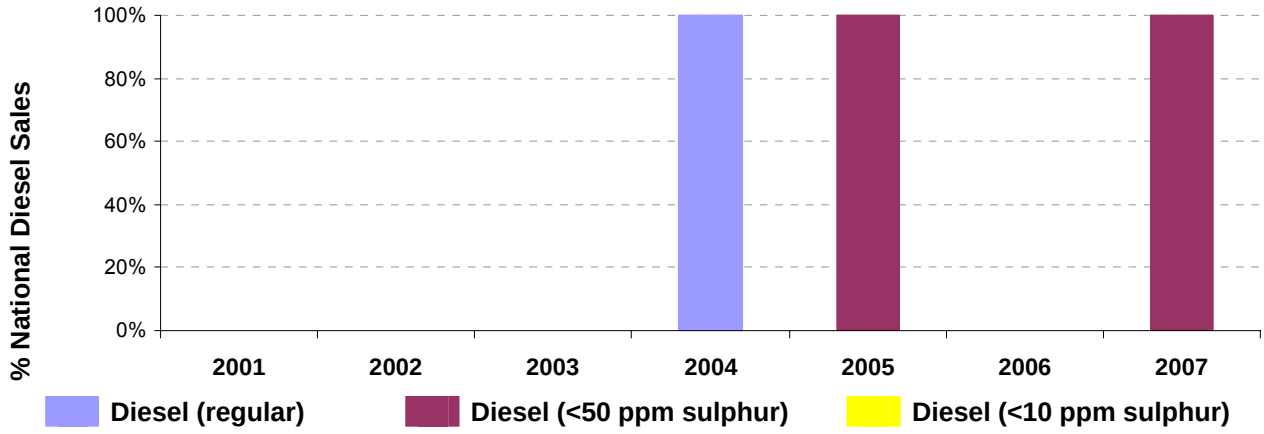
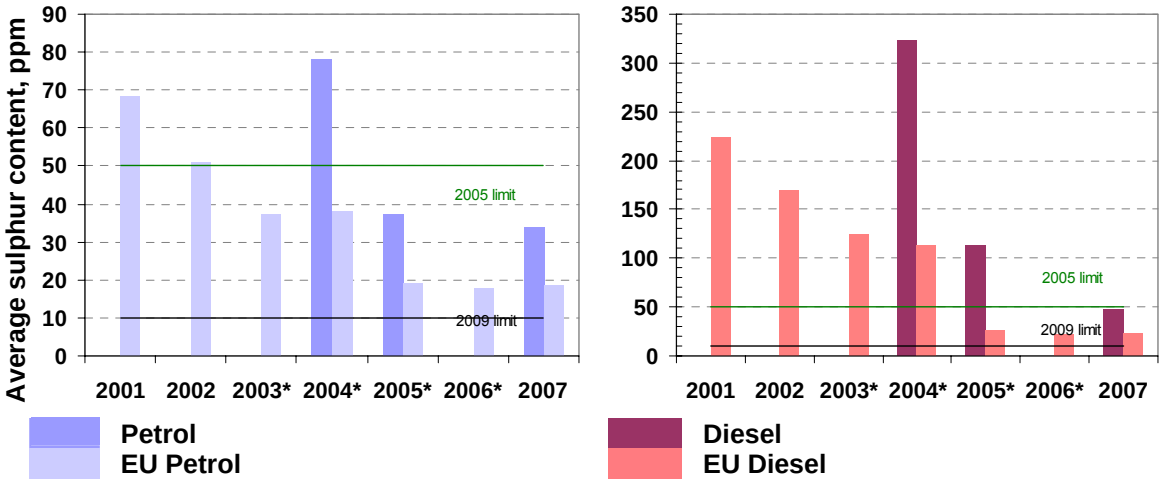



Figure 21.5 shows the trend in the average sulphur content of petrol and diesel fuels in Malta compared with the EU average. The average sulphur content for both petrol and diesel was below the 2005 limit (<50 ppm) but above the EU average for 2007.

**Figure 20.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

# 20.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Malta was partially compliant with sampling and reporting requirements.<br>• A low number of samples were taken for all fuel grades – the maximum number of samples taken for one fuel grade was Ron 95 with 20 samples taken over the year.<br>• Malta has used a national monitorimg system – but has provided no justification.<br>• Some description of Malta's four regions has been provided but regional sampling data has not been provided. |

# 21 Netherlands

## 21.1 Fuel Availability 2007

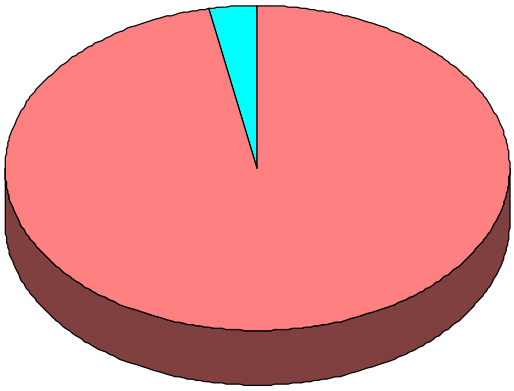
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

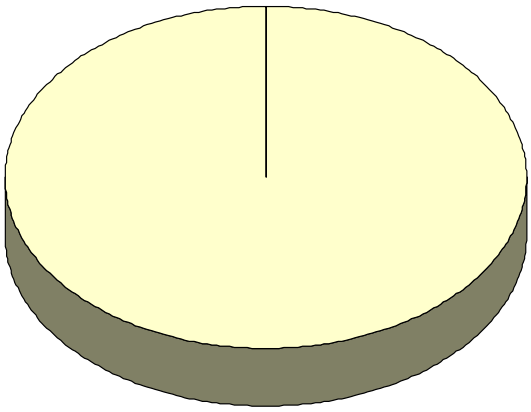
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 6 | RON 95 | <10 ppm | Ongelode benzine (RON = 95 & < 10 ppm S) | 6 |
| 12 | RON 98 | <10 ppm | Ongelode benzine (RON = 98 & < 10 ppm S) | 6 |
| 15 | Diesel | <10 ppm | Diesel | 15 |

### 21.1.1 Sales

**Figure 21.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 100.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 97.0% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 3.0% | | | |

Figure 21.1 shows that 96.3% of petrol sold in The Netherlands in 2007 was composed of sulphur free RON 95 grade. RON>98 <10ppm comprised the remaining sales of 3% (although with a .7% decrease in sales of this grade since 2006). No sulphur-free diesel grade was available in 2005, however due to fiscal incentives introduced at the start of 2005 100% of diesel fuel sold in 2007 was sulphur free.

### 21.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** No information provided.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No information provided.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Only sulphur-free grades have been sampled and reported on for 2007.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since 2001, although has increased by 2.9 ppm for petrol from 2006-2007, see Table 21.1. No separate sulphur-free diesel grade was available in 2005, however due to fiscal incentives introduced at the start of 2005 all fuel sold during 2007 met this criterion.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 21.1: Annual trend in average sulphur content in petrol and diesel fuels**

| NL | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 51 | 60 | 26 | 29 | 19 | 22 | 24.9 | 18 |
| *Diesel* | 42 | 34 | 31 | 34 | 8 | 11 | 8.1 | 23 |

## 21.2 Fuel Quality Monitoring 2007

### 21.2.1 Description of system

***Responsible organisation(s):*** Inspectorate for Environmental Health (VROM-Inspectorate).

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model A.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations.

***Time/frequency of sampling:*** Sampling was carried out in June -December 2007.

***Specification of test methods:*** As specified in Directive 98/70/EC.

***Collection of sales data:*** In the report the VROM-Inspectorate receives from the laboratory, the sales invoices are included.

***Other details:*** The Netherlands has 12 provinces. It was decided that samples would be taken from petrol stations in each province that sell fuel originating from diverse petrol companies. Furthermore, the number of inhabitants in each province was studied and a petrol station visit strategy was prepared, which resulted in 100 test checks (to be done) in total, spread over the summer and winter periods. The Netherlands aimed to meet the European Standard EN 14274:2003 Statistical Model A (small country).

### 21.2.2 Sampling and reporting

The Netherlands was largely compliant in 2007 with the sampling and reporting requirements however, insufficient summer period samples were taken. The following Table 21.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 21.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 6 | RON 95 <10 ppm S | 6 | 97.0% | 48 | 52 | 100 | Yes | 17 of 18 | **(1)** |
| 12 | RON 98 <10 ppm S | 6 | 3.0% | 0 | 0 | | | | |
| **P** | **Total Petrol** | | **100%** | **48** | **52** | **100** | | | |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 48 | 52 | 100 | Yes | 5 of 5 | |
| **D** | **Total Diesel** | | **100%** | **48** | **52** | **100** | | | |

**Notes:** S = Summer; W = Winter
(1) No sample analyses were provided for oxygen content (however analyses were carried out for individual oxygenates)

### 21.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* One sample had a value below Summer DVPE value maximum limit value of 60 kPa, and seven samples above the maximum value for Ethanol of 5 %(v/v).

*Statistical significance:* One DVPE summer sample exceeded the tolerance limit of 61.8 with a value of 62.5 kPa, five samples exceeded the Ethanol content tolerance limit of 5.2 % (v/v) giving values of 8.5 vol%, 9.0 vol%, 9.2 vol%, 15 vol% and 15.6 vol% ethanol and so these six samples were non-compliant with the Directive.

***Additional Information:*** Testing of petrol RON 95 showed that eighty-one samples exceeded sulphur free fuel maximum sulphur content of 10 mg/kg, although no data has been given on how many samples exceeded the tolerance limit of the Directive. At least one sample gave a sulphur content of 48.4 mg/kg and so was non-compliant with the Directive.

***Diesel***

None.

## 21.3 Temporal trends

Figure 21.2 to Figure 21.4 show the trend in total fuel sales and low sulphur fuel (<50 ppm) sales as a proportion of total sales. The Netherlands made the transition to 100% sulphur free petrols and diesels between 2006 and 2007.

**Figure 21.2: Temporal trends in national sales of petrol and diesel (million litres)**

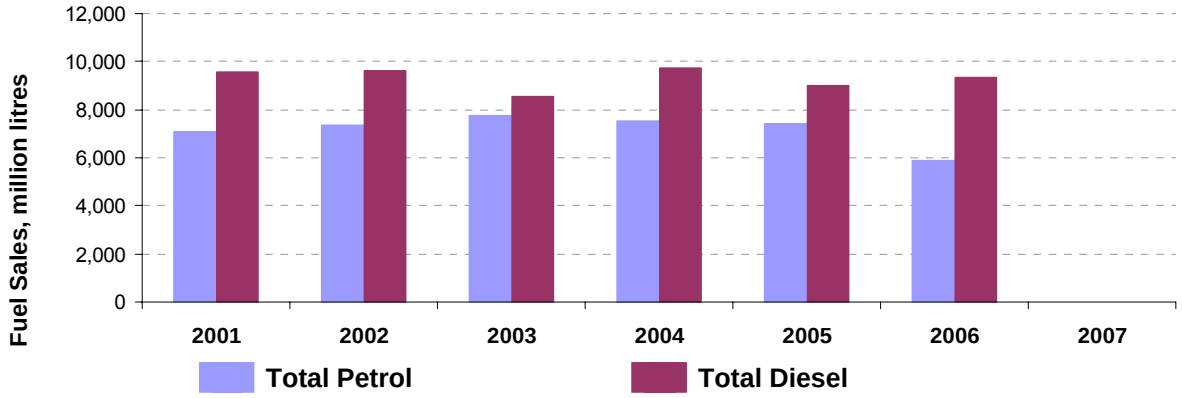



**Figure 21.3: Temporal trends in national sales of low sulphur petrol (%)**

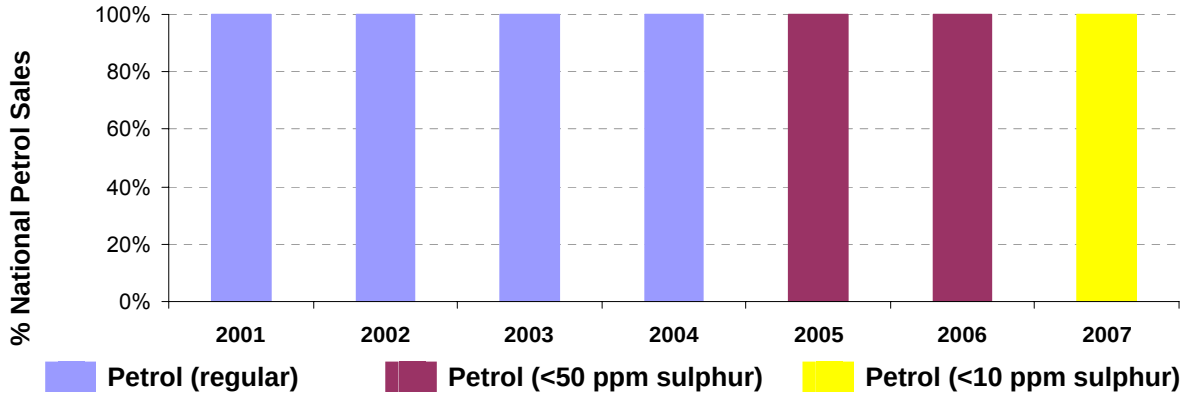



**Figure 21.4: Temporal trends in national sales of low sulphur diesel (%)**

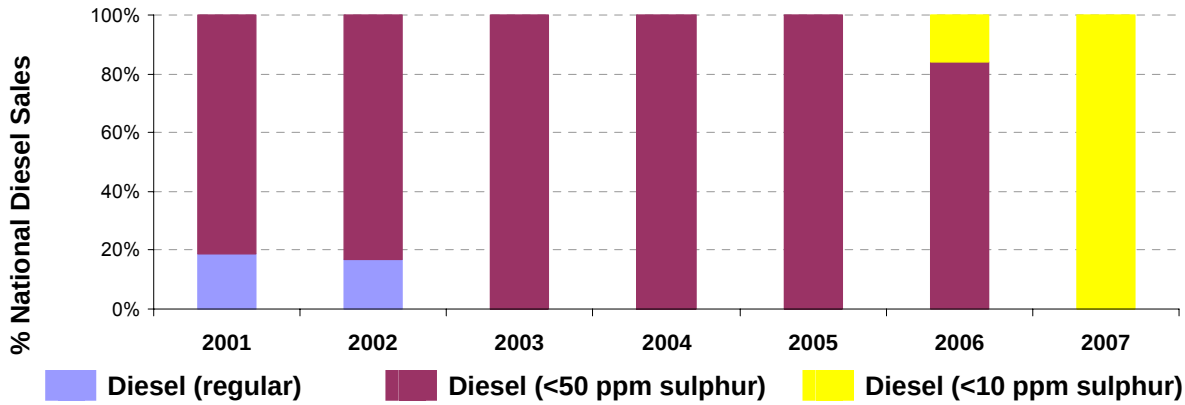
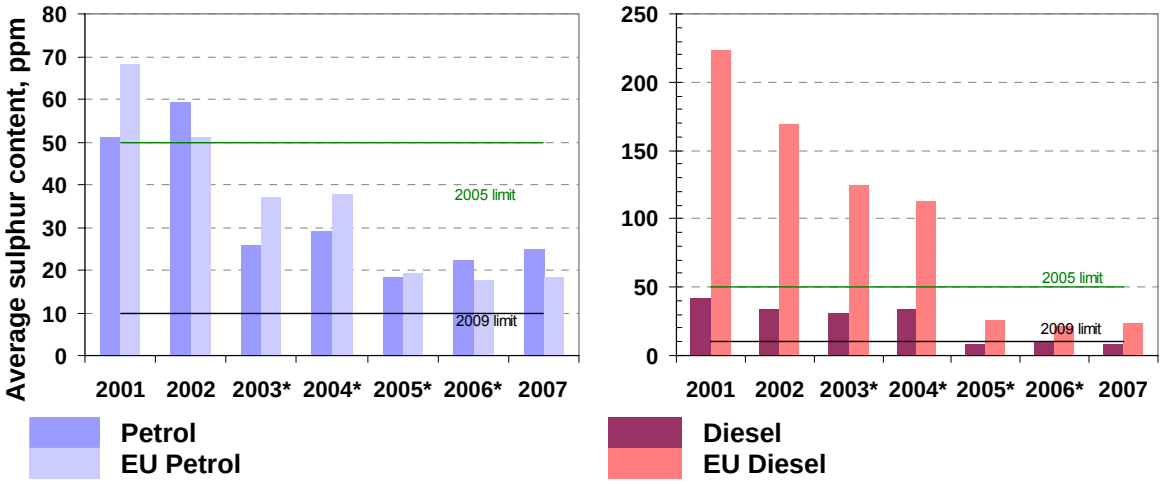



Figure 21.5 shows the trend in the average sulphur content of petrol and diesel fuels in the Netherlands compared with the EU average. The average sulphur content for both petrol and diesel was well below the 2005 limit (<50 ppm) but above the EU average for 2007 for petrol. The average sulphur content for diesel was below the EU average and the 2009 limit in 2007.

**Figure 21.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 21.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The Netherlands was partially compliant with sampling and reporting requirements:<br>- no samples of RON98 fuel were taken, and<br>- no analysis of overall oxygen content was performed.<br>• The Netherlands has provided no detail on the assessment of the geographical availability of sulphur-free fuels in its territory, or their labelling; however it is clear that sulphur-free fuels are widely available.<br>• The Netherlands has not provided sufficient information on samples that were non-compliant with the Directive although individual test results are availalable upon request; these results were not submitted at the time of report submission. |

# 22 Poland

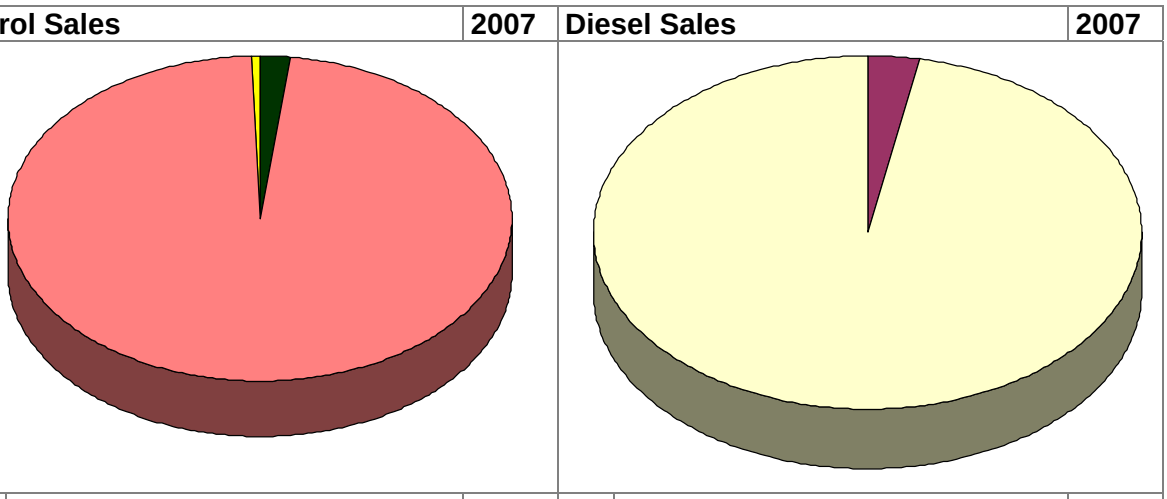
## 22.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | benzynę bezołowiową RON 95 | 5 |
| 6 | RON 95 | <10 ppm | benzynę bezołowiową RON 95 <10ppm | 5 |
| 11 | RON 98 | <50 ppm | benzynę bezołowiową RON 98 | 11 |
| 12 | RON 98 | <10 ppm | benzynę bezołowiową RON 98 <10ppm | 11 |
| 14 | Diesel | <50 ppm | Diesel Fuel 50ppm | 14 |
| 15 | Diesel | <10 ppm | Diesel Fuel 10ppm | 14 |

### 22.1.1 Sales

**Figure 22.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 3.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 97.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 1.8% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 97.6% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 0.6% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Low sulphur and sulphur-free sulphur fuel grades are available in Poland for both petrol and diesel fuels in large quantities. However, due to the fact that the current tariff does not

distinguish sulphur free fuels, precise determination of the share of petrol and diesel fuel with a sulphur content to 10 mg / kg in the total volume of imports and intra-acquisition has not been not possible. Figure 22.1 shows that the majority (97%) of diesel sold was sulphur free, although this has been sampled, analysed and reported in combination with low sulphur diesel. Petrol Sales have been provided by Poland based on estimated data.

### 22.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** The 2007 report presents data obtained on the basis of the quality of liquid fuels by the Inspectorate of Commerce during the period from January to December 2007. The audit was conducted throughout the country. According to the Directive, for monitoring purposes, the territory of Poland is divided into regions, in accordance with the administrative divisions of the country.

The tariff in Poland does not distinguish sulphur free fuels so precise measurement of 'sulphur free' grade fuels was impossible. Quality control of liquid fuels in the European part of the system included the following types of fuels that are traded on the country, namely:

• RON 95 unleaded petrol

• RON 98 unleaded petrol

• Diesel fuel

Production of motor gasoline with a sulphur content to 10 mg / kg was 3,680 thousand tonnes and production of diesel fuel with a sulphur content to 10 mg / kg amounted to 7,231 thousand tonnes.

Energy Market Agency information shows that in 2007 748 thousand tonnes of petrol fuel and 2,899 thousand tonnes of diesel were imported and purchased. However, due to the fact that the current tariff does not distinguish sulphur free fuels, precise determination of the share of petrol and diesel fuel with a sulphur content to 10 mg / kg in the total volume of imports and intra-acquisition was not possible.

In addition, based on estimates of the Polish Organization of Industry and Trade Oil on the consumption of sulphur free fuels, it can be concluded that the share of gasoline with a sulphur content to 10 mg / kg represents approximately 86%, while the share of diesel with a sulphur content to 10 mg / kg amounted to approximately 97%.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No.

***Average sulphur content of all petrol and diesel sold:*** Table 22.1 shows the average content of fuel sold in 2007 in relation to the EU27 average.

***Additional information:*** -

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 22.1: Annual trend in average sulphur content in petrol and diesel fuels**

| PL | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 60 | 27 | 20 | 8 | 18 |
| *Diesel* | | | | 124 | 53 | 14 | 17 | 23 |

# 22.2 Fuel Quality Monitoring 2007

## 22.2.1 Description of system

***Responsible organisation(s):*** The Office of Competition and Consumer Protection is responsible for Poland's Fuel Quality Monitoring System.

The tasks relating to the management of the system are carried out by Trade Inspection, which conducts inspections of fuel quality. Analysis of the quality of the fuel is undertaken by accredited laboratories for sampling analysis as set out in the Directive on testing methods.

Poland has adopted a system to monitor fuel quality specified in EN 14 274 Automotive fuels - Assessment of the quality of gasoline and diesel fuels and uses FQMS Model B - taking into account the diversity of conditions in Poland.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model B.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal)

***Location(s) of sampling:*** Refuelling stations

***Time/frequency of sampling:*** Monthly throughout the year, except December (RON 95), September (RON98) and January, February and September (Diesel).

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** Provided by the Energy Market Agency SA.

## 22.2.2 Sampling and reporting

Poland was essentially compliant with the sampling and reporting requirements in 2007. The Polish FQMS has been operating since 2004 according to EN 14274 Statistical Model B. Table 22.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 22.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 1.8% | 177 | 161 | 338 | Yes | All of 18 | (1) (2) |
| 6 | RON 95 <10 ppm S | 5 | 97.6% | | | | | | (1) (2) |
| 11 | RON 98 <50 ppm S | 11 | 0.6% | 84 | 129 | 213 | Yes | All of 18 | (1) (2) |
| 12 | RON 98 <10 ppm S | 11 | 0.0% | | | | | | (1) (2) |
| **P** | **Total Petrol** | | **100%** | **261** | **292** | **551** | **Yes** | **All of 18** | (1) |
| 14 | Diesel <50 ppm S | 14 | 3.0% | 170 | 152 | 206 | Yes | All of 5 | (1) |
| 15 | Diesel <10 ppm S | 14 | 97.0% | | | | | | (1) |
| **D** | **Total Diesel** | | **100%** | **170** | **152** | **206** | **Yes** | **All of 5** | (1) |

**Notes:** S = Summer; W = Winter

(1) Poland took action on fuel sample non-compliances; by sending a notice to the Public Prosecutor's Office and the President of Energy Regulatory Office, sending a notice to the police or the Regional Inspectorate of Commerce did not take action because of ongoing Inspectorate of Commerce administrative proceedings.

(2) RON 95 and RON 98 fuel have been reported with no differentiation in sulphur split between <10ppm and <50ppm sales

### 22.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* The limit values for RON, MON, summer vapour pressure, distillation at 100°C, aromatics, benzene, ethanol and sulphur content (of minimum 95, minimum 85, 60 kPa, 46.0%v/v, 35.0%v/v, 1%v/v, 5%v/v and 50 ppm, respectively) were exceeded. Values, by parameter, reached extremes of 90.1, 81.4, 69.9 kPa, 29.1%v/v, 52.1%v/v, 8%v/v, 5.7%v/v, and 432ppm.

*Statistical significance:* The test method tolerance limits for statistical significance for the following parameters were exceeded: RON, MON, summer vapour pressure, distillation at 100°C, Aromatics, Benzene, Ethanol and sulphur content.

In total, 27 samples of RON 95 were non-compliant with the Directive.

*Member State's notes:* All non-compliant sample results were notified to the Public Prosecutor's Office. One sample was brought to the attention of the police and in the case of the non-compliant Sulphur sample, the Regional Inspectorate of Commerce has not taken action because of ongoing Inspectorate of Commerce administrative proceedings.

***RON 98 Petrol***

*Detail:* Summer vapour pressure and aromatics limit values (of 60 kPa and 35.0%v/v) were exceeded. Values, by parameter, reached extremes of 64.6kPa and 37.8%v/v.

All other samples tested were within the tolerance limits for Directive limit values.

| | |
|---|---|
| *Statistical significance:* | The tolerance limits for statistical significance were exceeded for three samples, one summer vapour pressure sample at 64.6kPa exceeded the tolerance limit of 61.8kPa and two aromatics samples exceeded the tolerance limit of 37.2%v/v. |
| *Member State's notes:* | The Public Prosecutor's Office and the President of Energy Regulatory Office were notified of the non-compliant summer vapour pressure sample. Poland comments that a sample of control meets the quality requirements with regard to aromatics non-compliance. |

***Diesel***

| | |
|---|---|
| *Detail:* | Cetane number and sulphur content limit values (of 51 and 50 ppm) were exceeded. Values, by parameter, reached extremes of 50.2 and 1416 ppm. |
| *Statistical significance:* | The sample results were within the tolerance limits for statistical significance for cetane number test methods (of 48.5). The tolerance limits for statistical significance for sulphur content is 54.0 and was exceeded by two samples giving values of 1416ppm and 1112ppm. |
| *Member State's notes:* | The Public Prosecutor's Office and the President of Energy Regulatory Office were notified of the non-compliant sulphur content samples. |

## 22.3Temporal trends

Figure 22.2 to Figure 22.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Please note that as sales data for the separate petrol fuel grades has not been provided in the 2007 Polish Fuel Quality Monitoring and Sampling report, sales figures do not translate to the trends graph. However it is known that 4,109,000 tonnes of petrol was sold and consumed in Poland during the 2007 reporting period and 9,444,000 tonnes of diesel.

**Figure 22.2: Temporal trends in national sales of petrol and diesel (million litres)**

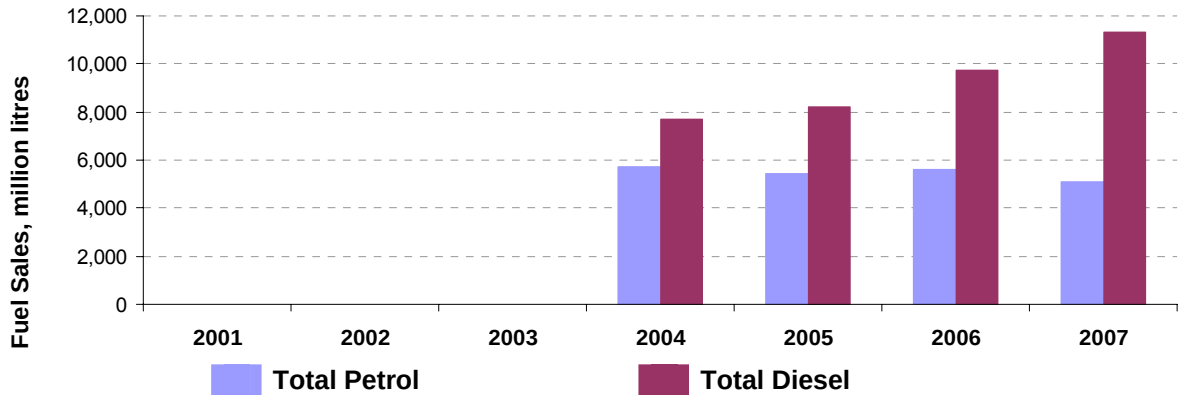


**Figure 22.3: Temporal trends in national sales of low sulphur petrol (%)**

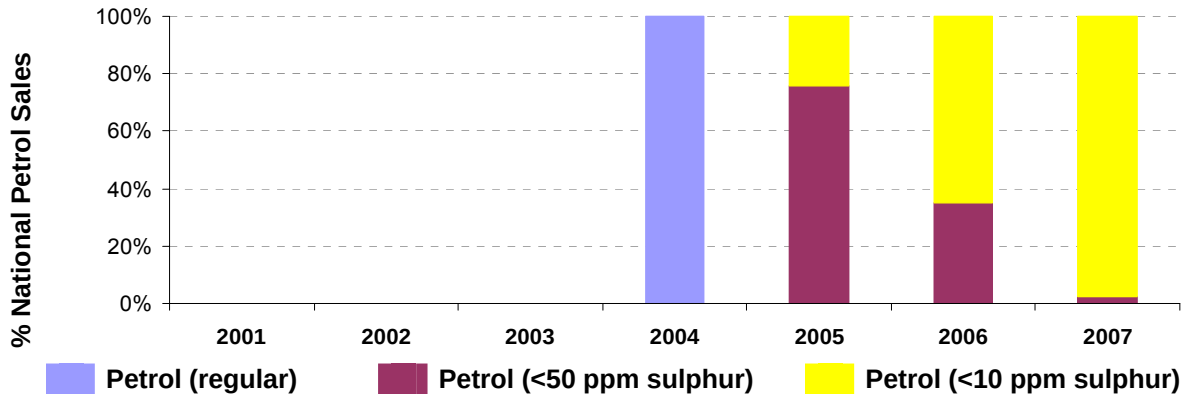



**Figure 22.4: Temporal trends in national sales of low sulphur diesel (%)**

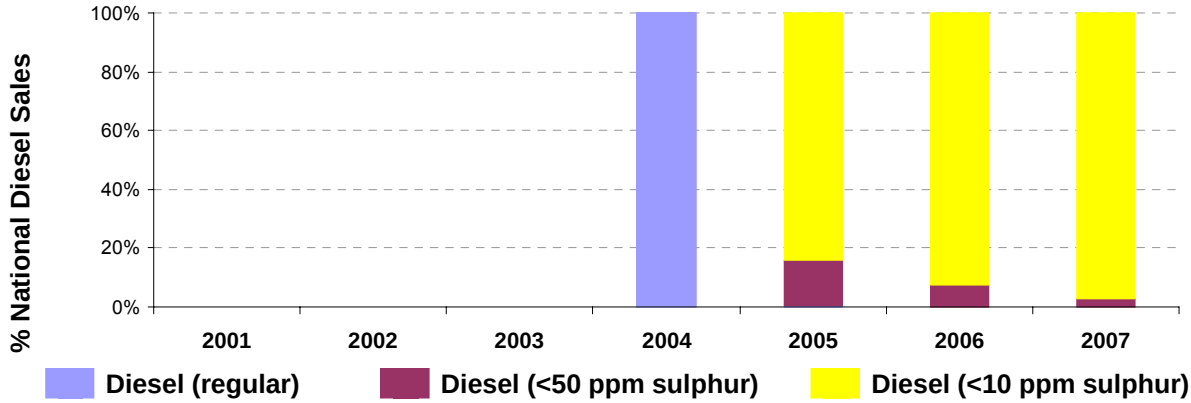
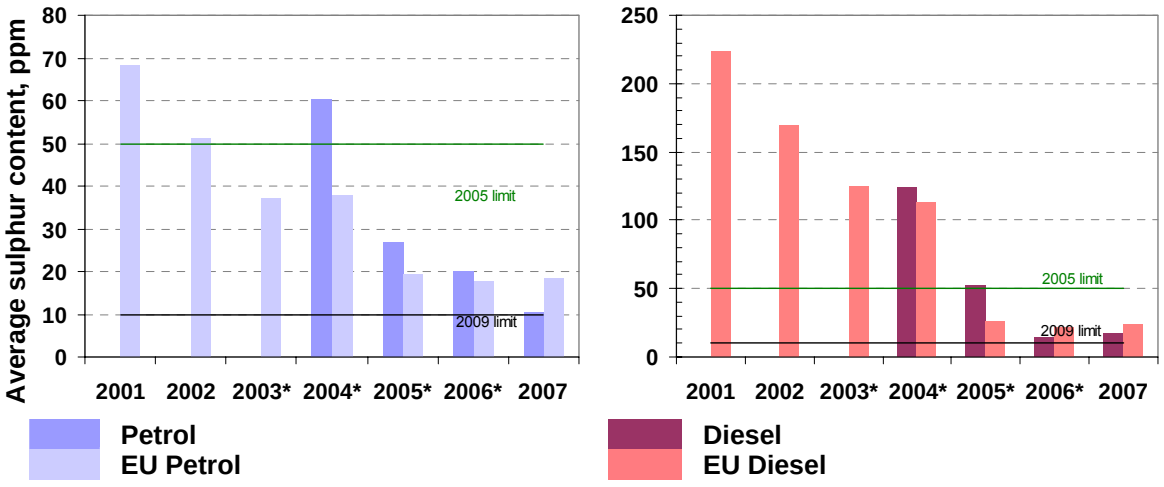



Figure 22.5 shows the trend in the average sulphur content of petrol and diesel fuels in Poland compared with the EU average (derived from sample analysis results and relative sales). The shift to low-sulphur and sulphur-free fuels resulted in a significant reduction in sulphur content from 2004. The average sulphur content of petrol and diesel was well below the 2005 limit of 50ppm and also below the EU average in 2007. Additionally, for petrol in 2007 the average sulphur content was also below the forthcoming 2009 limit (10ppm).

**Figure 22.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 22.4Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
| --- |
| • According to the Directive, Poland should report separate results for each of the fuel grades as sulphur-free grades are reported to represent the majority of fuel sales but have been reported in combination with low-sulphur fuel grades. |

# 23 Portugal

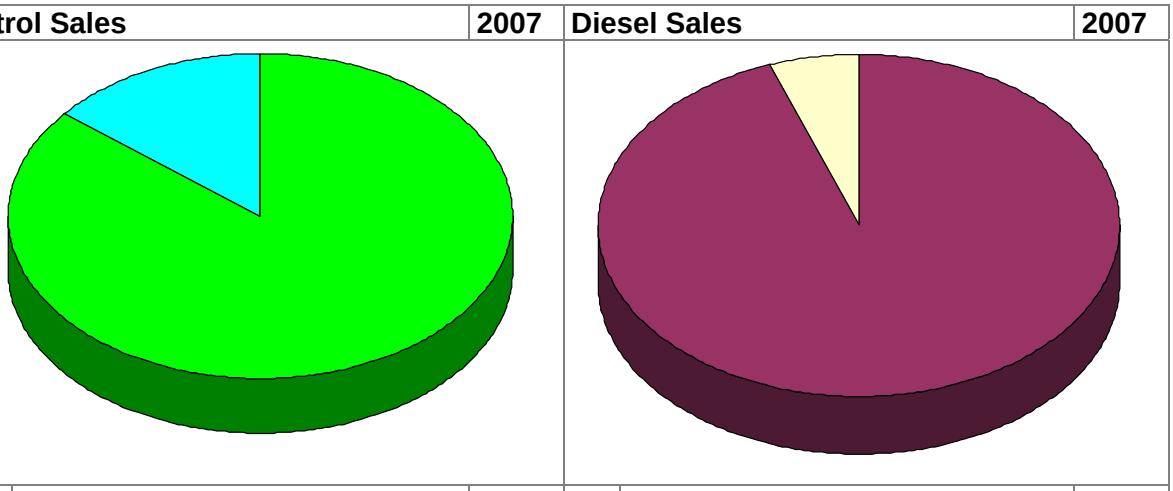
## 23.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 8 | 95<RON<98 | <50 ppm | Euro Super | 8 |
| 12 | RON 98 | <10 ppm | Super plus | 12 |
| 14 | Diesel | <50 ppm | Gasóleo | 14 |
| 15 | Diesel | <10 ppm | Gasóleo | 14 |

### 23.1.1 Sales

**Figure 23.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 94.5% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 5.5% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 85.8% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 14.2% | | | |

Figure 23.1 shows that in Portugal the majority of petrol marketed sales in 2007 was low sulphur 95=<RON<98 (85.8%) with the remainder petrol sales comprised of RON>=98 sulphur free fuel (decreasing from 16.5% to 14.2% since 2006). A small quantity of sulphur-free diesel (5.5%) was sold (decreasing 0.1% since 2006).

### 23.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Unleaded petrol (minimum RON >= 98) with less than 10 ppm sulphur is distributed all over the country. Diesel with less than 10 ppm sulphur, is distributed in approximately 200 highway/motorway refuelling stations and urban retail sites.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes for petrol, no for diesel.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of diesel has decreased significantly since 2001. However, 2007 sulphur content increased to 31 from 28 ppm in 2006. The average sulphur content of petrol decreased significantly from 2004 but increased from 2005 to 2006, as shown in Table 23.1, the average sulphur content of petrol has decreased again in 2007.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 23.1: Annual trend in average sulphur content in petrol and diesel fuels**

| PT | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 447 | 57 | 61 | 71 | 16 | 23 | 20 | 18 |
| *Diesel* | 272 | 296 | 261 | 241 | 37 | 28 | 31 | 23 |

## 23.2 Fuel Quality Monitoring 2007

### 23.2.1 Description of system

***Responsible organisation(s):*** DGEG (Directorate General of Energy and Geology).

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** The companies themselves carry out tests, taking samples in refineries and terminals. Samples in retail sites are taken across the country by government authorities. There are two refineries that supply the market, one of them in the north and the other in the south. Test methods are those specified in Directive 98/70/CE.

***Time/frequency of sampling:*** Sampling was taken monthly for all petrol and diesel fuel grades and no samples were reported in the transitional months of April and October for all fuel types and grades in accordance with the EN 14274 statistical model.

***Specification of test methods:*** Methods specified in Directive 98/70/EC.

***Collection of sales data:*** Fuel companies report sales figures to the DGEG monthly.

***Other details:*** The EN 14274 statistical model is being implemented. Meanwhile Portugal will follow the same methodology used in precedent reports.

### 23.2.2 Sampling and reporting

Portugal was not compliant with the sampling and reporting requirements in 2007 and sampling numbers were not sufficient to give equivalent confidence with EN 14274. Portugal is yet to implement a monitoring system in full compliance with the requirements of EN 14274. Table 23.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 23.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement (1) | | | |
| 8 | 95<RON<98 <50 ppm S | 8 | 85.8% | 31 | 24 | - | Yes | 15of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 14.2% | 28 | 24 | - | Yes | 15 of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **59** | **48** | **-** | **Yes** | **15 of 18** | (1) |
| 14 | Diesel <50 ppm S | 14 | 94.5% | 38 | 28 | - | Yes | 5 of 5 | (1) |
| 15 | Diesel <10 ppm S | 14 | 5.5% | 0 | 0 | - | | | (1) |
| **D** | **Total Diesel** | | **100%** | **38** | **28** | **-** | **Yes** | **5 of 5** | (1) |

**Notes:** S = Summer; W = Winter
(1) Portugal states the EN 14274 statistical model is being implemented. Meanwhile Portugal is using a National Methodology. However, this has been stated in the previous two years reports also.

### 23.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95-98***

*Detail:* One or more samples exceeded the summer vapour pressure limit value of 60 kPa, with a maximum of 61 kPa. Sample(s) were also above the sulphur limit value of 50 mg/kg, with a maximum of 52 mg/kg.

*Statistical significance:* The tolerance limit for statistical significance for vapour pressure test method is 61.8 kPa, and for sulphur is 54 mg/kg (using testing method EN 24260), therefore the sample(s) were compliant with the Directive.

***Petrol RON 98***

*Detail:* One or more samples exceeded the summer vapour pressure limit value of 60 kPa, with a maximum of 61.7 kPa. One or more samples also exceeded the Oxygen content limiting value of 2.7% (v/v) and one or more samples exceeded the limiting value for sulphur content of 10 mg/kg with a maximum value of 12 mg/kg.

*Statistical significance:* The tolerance limit for statistical significance for vapour pressure test method is 61.8 kPa, therefore the sample(s) were compliant with the Directive. The tolerance limits for oxygen content and sulphur content are 2.9% (m/m) and 12 mg/kg so sample(s) were compliant with the Directive.

***Diesel***

| | |
|---|---|
| *Detail:* | One or more samples of Diesel fuel exceeded the limiting values for cetane number, density at 15oC, Distillation and sulphur content with reported values of; 49.5, 845.1 kg/m$^3$, 362.4oC and 53.9 mg/kg respectively. |
| *Statistical significance:* | The tolerance limit for statistical significance for the test methods were not exceeded for these samples, which were all therefore compliant with the Directive. Tolerance limits for cetane number is 48.5 (minimum tolerance limit), for density at 15oC is 845.7 kg/m$^3$, for distillation the tolerance limit is 365.9oC and sulphur is 54 mg/kg. |

## 23.3 Temporal trends

Figure 23.2 to Figure 23.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. From 2001 to 2007, the sales of petrol have decreased by 3% (a shift from 2006 when sales had increased by 3%) while sales of diesel showed a decrease of 5%. There was a complete shift from 'regular' to low-sulphur and sulphur-free fuels in 2005.

**Figure 23.2: Temporal trends in national sales of petrol and diesel (million litres)**

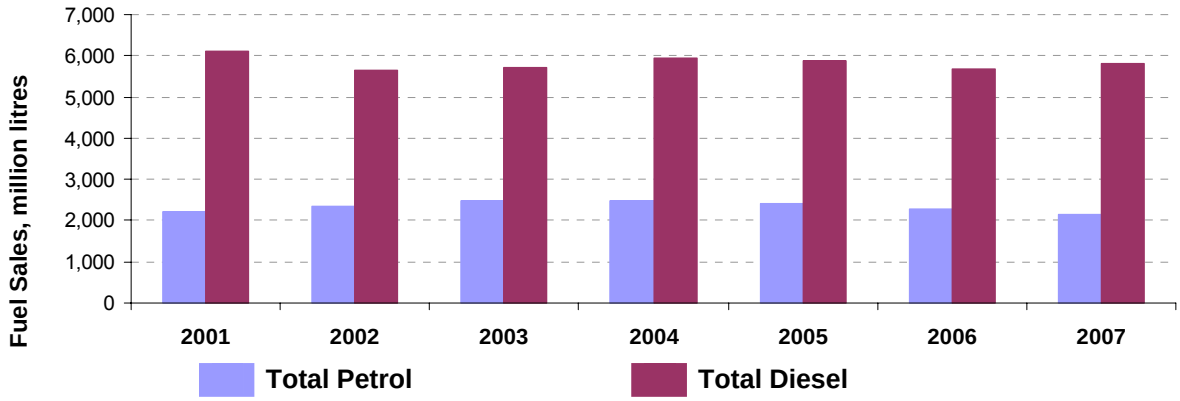


**Figure 23.3: Temporal trends in national sales of low sulphur petrol (%)**

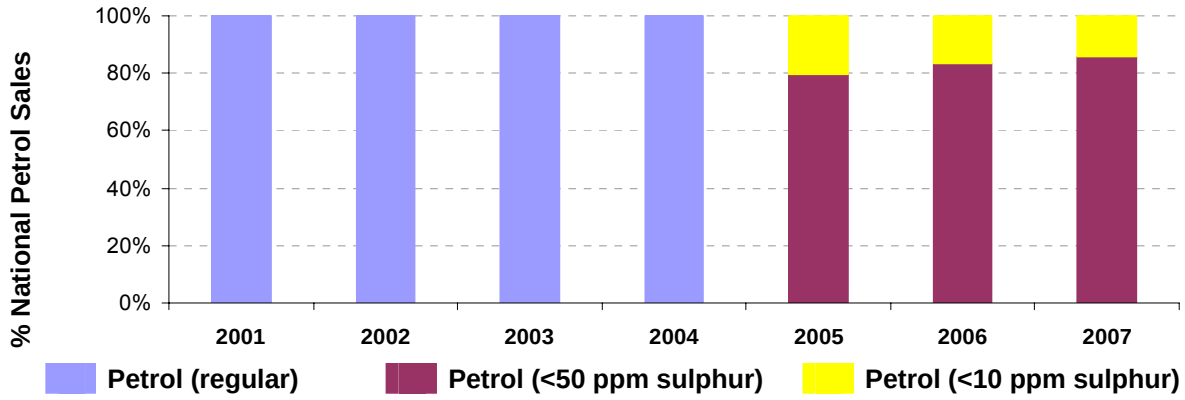



**Figure 23.4: Temporal trends in national sales of low sulphur diesel (%)**

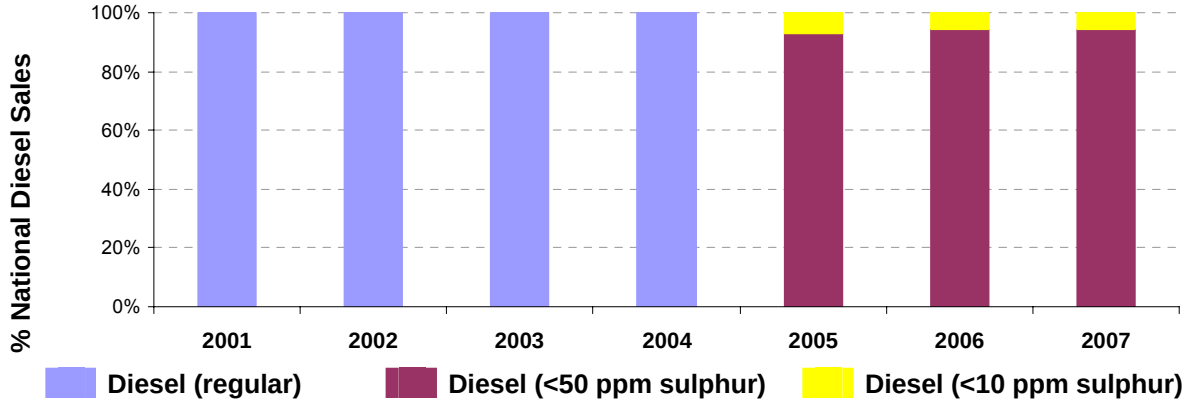
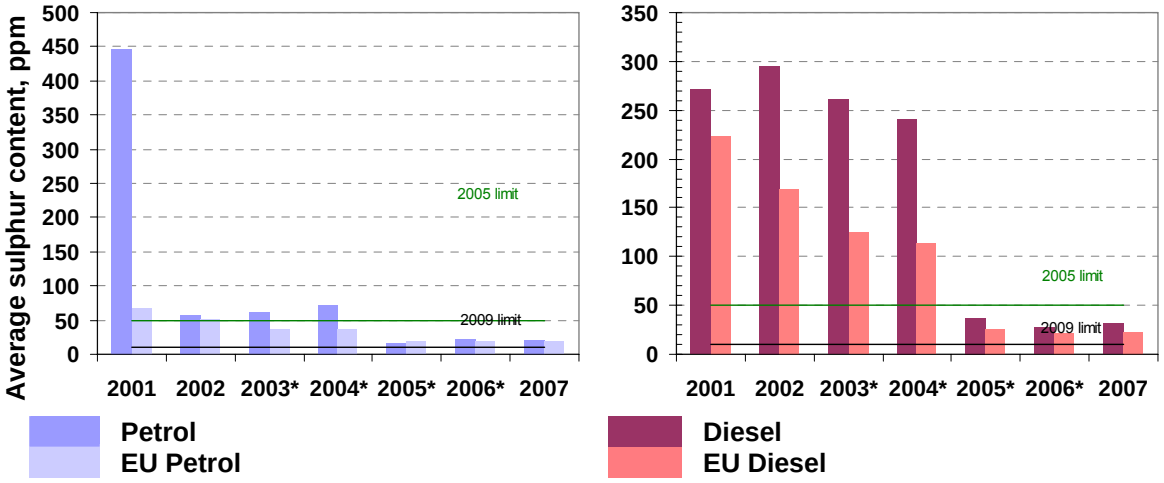



Figure 23.5 shows the trend in the average sulphur content of petrol and diesel fuels in Portugal compared with the EU average. The change to low sulphur and sulphur-free fuels in 2005, resulted in a significant reduction in sulphur content, to well below the 50ppm limit. The average sulphur content for petrol and diesel was above the EU.

**Figure 23.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 23.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
| --- |
| • Portugal's National FQMS does not appear to be equivalent in confidence with the requirements of EN 14274. A small number of samples were taken, and these were taken at refineries, terminals and refuelling stations. Portugal should indicate the number of samples taken at refuelling stations.<br>• Portugal was mostly compliant with reporting requirements. |

# 24 Romania

Romania joined the EU in 2007 and although the Member State reported on monitoring in 2006, this is the first year that Romania has been required report on monitoring.

## 24.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported. Note that Romania joined the European Union on 1 January 2007. Therefore in 2006 the 50ppm sulphur limit under the Directive did not apply. Romania has advised that since EU accession, only low sulphur and sulphur free fuels have been marketed in its territory.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Petrol Minimum RON 95 | 5 |
| 6 | RON 95 | <10 ppm | Petrol Minimum RON 95 <10ppm sulphur | 6 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel <10ppm sulphur | 15 |

### 24.1.1 Sales

**Figure 24.1: National fuel sales volume proportions by fuel type (%)**

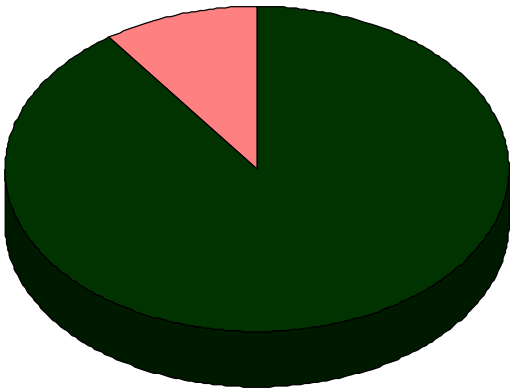
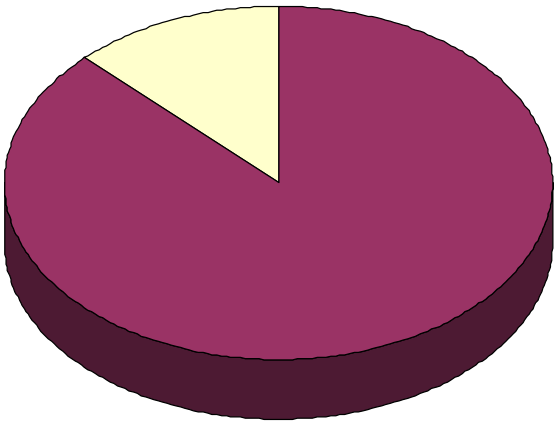
| Petrol Sales | | 2007 | Diesel Sales | | 2007 |
|---|---|---|---|---|---|
|  | | |  | | |
| | **Fuel Type** | **%** | | **Fuel Type** | **%** |
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 87.4% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 12.6% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 90.1% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 9.9% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 25.1 shows that the majority (90.1%) of petrol sold was of low sulphur RON 95 grade and the remaining 9.9% was sulphur free RON 95 petrol. A higher proportion of diesel fuel sold in Romania in 2007 was sulphur free (12.6%).

### 24.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur free fuels were available in all of the service stations in each of Romania's eight regions in 2007 – an increase in availability compared to the previous year.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** No information provided.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** Table 25.1 shows the average content of fuel sold in 2007 in relation to the EU27 average. The sulphur content of diesel fuel shows an increase since joining the EU in 2007 and exceeds 50ppm, whereas the sulphur content of Petrol fuels have decreased.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 24.1: Annual trend in average sulphur content in petrol and diesel fuels**

| RO | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | | | 48 | 34 | 18 |
| *Diesel* | | | | | | 46 | 53 | 23 |

## 24.2 Fuel Quality Monitoring 2007

### 24.2.1 Description of system

***Responsible organisation(s):*** Ministry of Economy and Finance.

***Format of Fuel Quality Monitoring System (FQMS):*** Due to the lack of sales data per region, Statistical Model C as prescribed in European Standard EN 14274:2003 was applied.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations.

***Time/frequency of sampling:*** Samples were taken in April and July for all petrol and diesel fuel grades. Samples of low sulphur petrol were then taken from September to December; Sulphur free fuels additionally in September and December only. For Diesel low sulphur diesel, samples were taken in November and December, and for sulphur free diesel samples were taken additionally only in December.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** Ministry of Economy and Finance.

### 24.2.2 Sampling and reporting

Romania was essentially compliant with sampling and reporting requirements in 2007, with the exception of the number of samples taken remains low. The following Table 25.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 24.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 5 | RON 95 <50 ppm S | 5 | 90.1% | 37 | 51 | 100 | Yes | All of 18 | (1) |
| 6 | RON 95 <10 ppm S | 6 | 9.9% | 2 | 11 | 10 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **39** | **62** | **110** | **Yes** | **All of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 87.4% | 39 | 62 | 100 | Yes | All of 5 | (2) |
| 15 | Diesel <10 ppm S | 15 | 12.6% | 2 | 2 | 100 | Yes | All of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **41** | **64** | **200** | **Yes** | **All of 5** | **(2)** |

**Notes:** S = Summer; W = Winter

(1) No details given on the number of samples that exxceeded tolerance limits, or the values by which samples exceeded tolerance limits.

(2) NACP fined all stations that did not respect environmental specifications. 12 Sulphur exceedances have been reported, however no details on other non-compliant parameters.

### 24.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol <50ppm sulphur***

*Detail:* The minimum sample results for RON and MON (of 93.9 and 84 respectively) were below the minimum limit values (of 95 and 85). The maximum limit values for aromatics (35.0 %v/v), Benzene (1 %v/v) and sulphur content (50 ppm) were exceeded, with maximum values of 39%v/v 1.7%v/v and 74 ppm.

*Statistical significance:* Of the above mentioned sample results all were beyond the tolerance limits for statistical significance for respective test methods: 94.6 (RON), 84.5 (MON), 37.2 %v/v (aromatics) and 1.1 % (v/v) (Benzene). Therefore these samples were non-compliant with the Directive.

At least one sulphur content sample exceeds the maximum tolerance limit of 61.8 mg/kg and was therefore non-compliant with the Directive.

*Member State's notes:* For 12 diesel fuels samples, the sulphur content exceeded the sulphur content limit according to the Directive. The Ministry of Economy and Finance informed The National Authority for Consumer Protection (NACP) and NACP fined all stations that did not respect environmental specifications. In order to prevent this situation in future, a supplementary mechanism has been developed to enable collaboration with The National Customs

Authority, which is the Division for Monitoring the Excises and Customs Operations and has responsibilities of fiscal inspection for the excisable products (according to the Government Decision no. 532/2007 regarding the organization and the functioning of the The National Customs Authority). According to this new mechanism, immediately after confirmation of non-compliant samples, the Division for Monitoring the Excises and Customs Operations is informed.

***RON 95 Petrol <10ppm sulphur***

*Detail:* One sample of Aromatics exceeded the limiting value of 35 % (v/v).

*Statistical significance:* The aromatics sample value of 36.5 % (v/v) does not exceed the maximum tolerance limit for the parameter (37.2 % (v/v) and so is compliant with the Directive.

***Diesel <50ppm sulphur***

*Detail:* The cetane number of 48.0 was below the minimum limit value of 51. The maximum limit values for density (845.0 kg/m$^3$), distillation at 95% (360°C) and sulphur content (50 mg/kg) were exceeded by several samples, with maximum values of 852.0 kg/m$^3$, 387.0°C and 748 mg/kg.

*Statistical significance:* All of the above mentioned sample results were beyond the tolerance limits for statistical significance for the respective test methods of: 48.5 (cetane), Density (845.7 kg/m$^3$) 365.9° C (distillation) and 61.8 mg/kg (sulphur content).

Therefore these samples were non-compliant with the Directive.

*Member State's notes:* As for RON 95 Petrol <50ppm sulphur.

***Diesel <50ppm sulphur***

*Detail:* The limit values for density (845.0 kg/m$^3$) and sulphur content (50 ppm) were exceeded by several samples, with maximum values of 846.4.0 kg/m$^3$ and 620ppm.

*Statistical significance:* These sample results were beyond the tolerance limits for statistical significance for cetane (48.5) and sulphur content (62.0 ppm), and were therefore non-compliant with the Directive.

*Member State's notes:* As for RON 95 Petrol <150ppm sulphur.

***Diesel <10ppm sulphur***

All samples tested were in compliance with limit values.

## 24.3 Temporal trends

Figure 25.2 to Figure 25.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Romania was not required to report on Fuel Quality Monitoring until 2007.

**Figure 24.2: Temporal trends in national sales of petrol and diesel (million litres)**

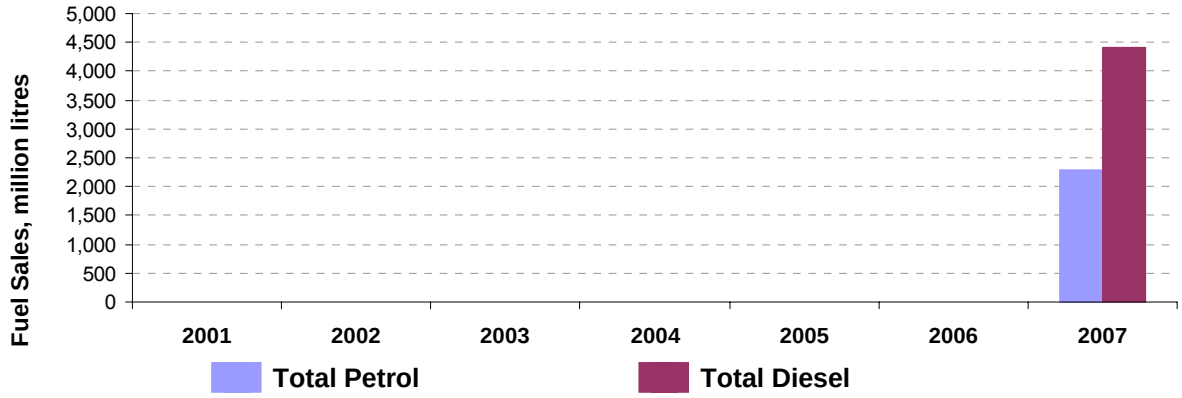



**Figure 24.3: Temporal trends in national sales of low sulphur petrol (%)**

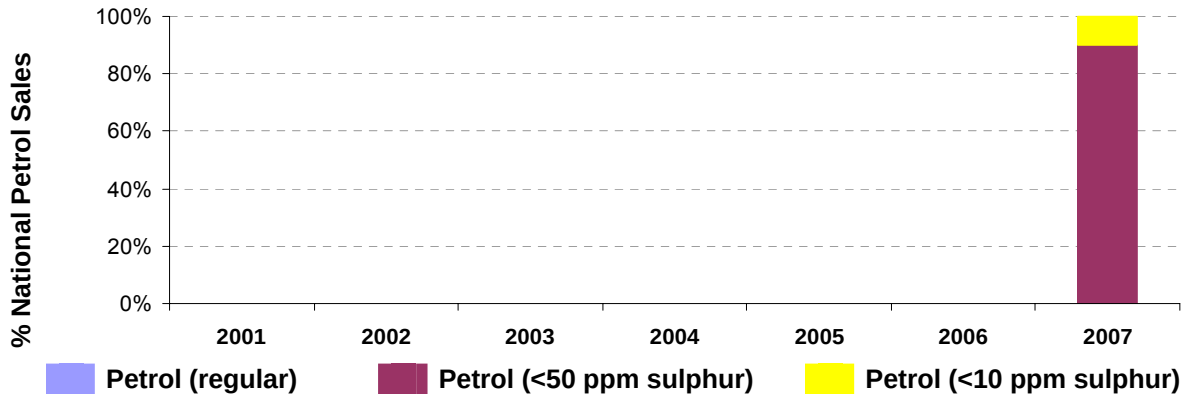



**Figure 24.4: Temporal trends in national sales of low sulphur diesel (%)**

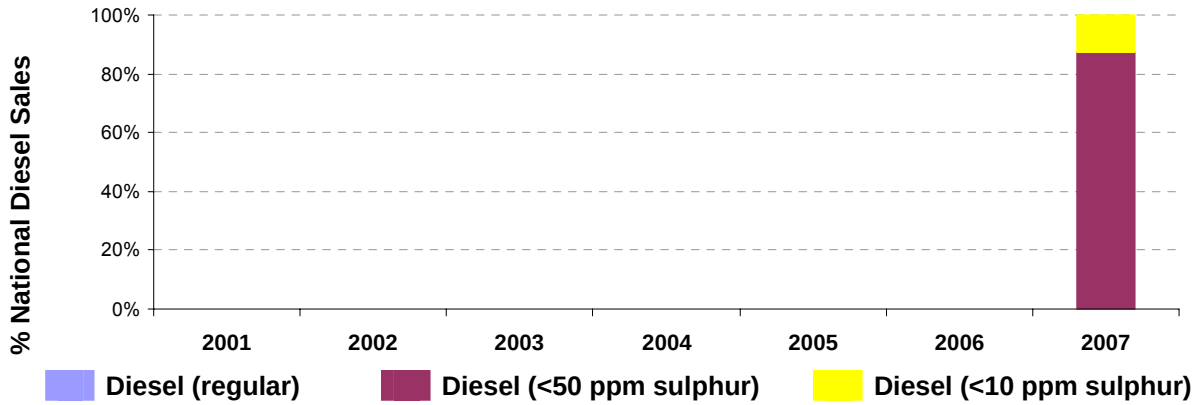
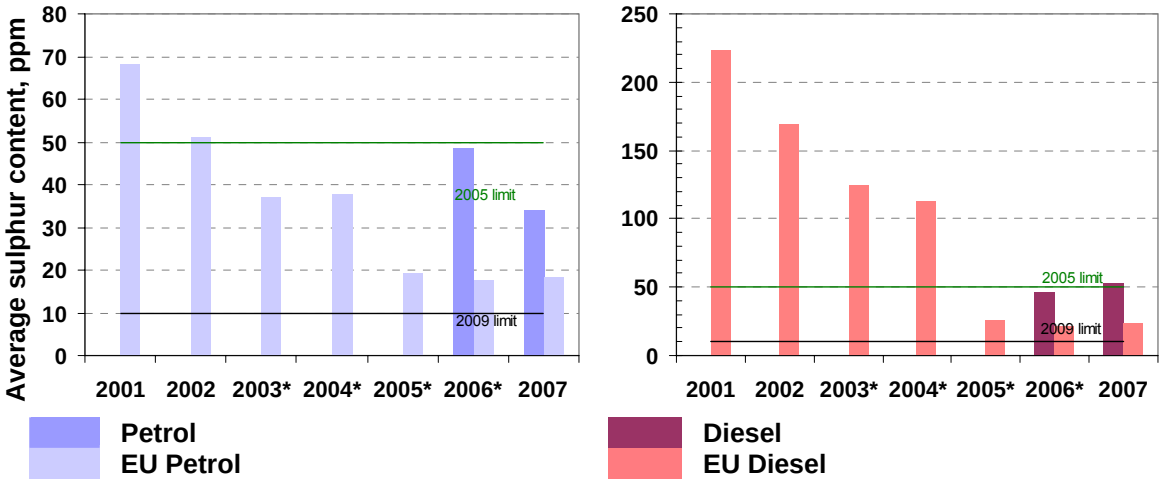



Figure 25.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Romania did not need to comply with the EU < 50ppm limit on sulphur in 2006, as it did not join the EU until 2007. Romania converted its petrol and diesel market to < 50 ppm in 2007. The average sulphur content of both petrol and diesel fuels in 2007 was well below the 2005 limit but the EU average was exceeded.

**Figure 24.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 24.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Romania has chosen to use Statistical Model C in its Fuel Quality Monitoring system. However, this does not appear entirely consistent with the European Standard specification (discussed in section 2.2.2). Instead statistical Model A seems more appropriate on the basis of the NUTS regional classification.<br>• Insufficient numbers of samples were taken to comply with Statistical Model C, which requires a minimum of 50 samples of each major fuel grade in each of the summer and winter periods.<br>• The average sulphur content of diesel fuel marketed as low sulphur remains very high, although fiscal measures have been put into place to address these incidences of non-compliance. |

# 25 Slovakia

## 25.1 Fuel Availability 2007

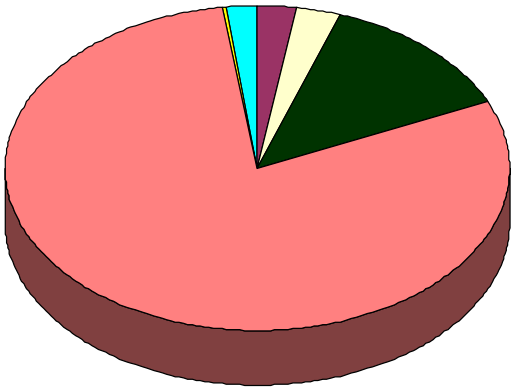
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported. However, the split of sulphur grades provided by Slovakia is based upon the results of the sample analysis and not actual marketed grades. There are actually only four national grades marketed in Slovakia: Normal 91, Super 95, Super Plus 98 and Diesel fuel.

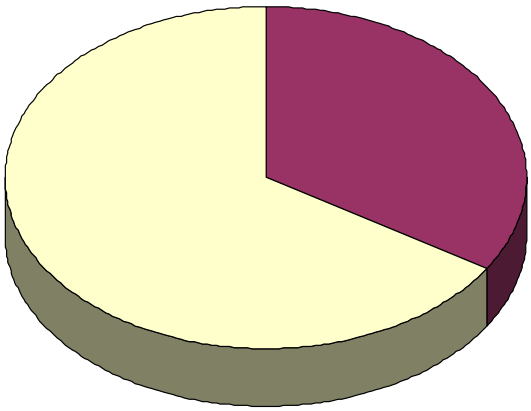
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 2 | RON 91 | <50 ppm | NORMAL 91 | None |
| 3 | RON 91 | <10 ppm | NORMAL 91 | None |
| 5 | RON 95 | <50 ppm | SUPER 95 | 5 |
| 6 | RON 95 | <10 ppm | SUPER 95 | 5 |
| 11 | RON 98 | <50 ppm | SUPER PLUS 98 | None |
| 12 | RON 98 | <10 ppm | SUPER PLUS 98 | 12 |
| 14 | Diesel | <50 ppm | Diesel | 14 |
| 15 | Diesel | <10 ppm | Diesel | 15 |

### 25.1.1 Sales

**Figure 25.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 2.4% | 14 | Diesel (<50 ppm sulphur) | 33.8% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 2.8% | 15 | Diesel (<10 ppm sulphur) | 66.2% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 13.0% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 79.7% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 0.1% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 1.9% | | | |

Figure 25.1 shows that the majority (79.7%) of petrol sold was of sulphur free RON 95 grade with the bulk of the remainder comprising low sulphur RON 95 (13%). RON 91 and RON 98 grades comprise only 5.2 % and 2% respectively – a reduction on 2006 sales of these grades. 66.2% of the diesel fuel sold was sulphur free. (N.B. there are actually only four official national grades, although Slovakia has provided estimated sales data for fuels complying with different sulphur levels).

### 25.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Sulphur free fuels were available in significant quantities for petrol and diesel across Slovakia in 2007.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** The sulphur-free fuels (<10 ppm sulphur) were sometimes, but not always labelled as such.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** Yes.

***Average sulphur content of all petrol and diesel sold:*** Table 25.1 shows the average content of fuel sold in 2004 to 2007 in relation to the EU25 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 25.1: Annual trend in average sulphur content in petrol and diesel fuels**

| SK | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 8 | 7 | 10 | 6 | 18 |
| *Diesel* | | | | 117 | 13 | 15 | 13 | 23 |

## 25.2 Fuel Quality Monitoring 2007

### 25.2.1 Description of system

***Responsible organisation(s):*** Slovak Inspectorate of the Environment. The analyses of samples were carried out by Slovnaft VURUP (Testing laboratories accredited according to ISO/IEC 17025).

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations.

***Time/frequency of sampling:*** Samples were taken most months across the winter and summer periods.

***Specification of test methods:*** In compliance with Directive 98/70/EC.

***Collection of sales data:*** The Ministry of Environment of Slovak Republic is responsible for collection of data directly from motor fuel distributors/dealers.

### 25.2.2 Sampling and reporting

Slovakia was almost completely compliant with the sampling and reporting requirements in 2007, but did not take and test any samples of RON91 grade petrol. Table 25.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 25.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 2 | RON 91 <50ppm S | 2 | 2.4% | 0 | 0 | 3 | | | |
| 3 | RON 91 <10ppm S | 2 | 2.8% | 0 | 0 | | | | |
| 5 | RON 95 <50 ppm S | 5 | 13.0% | 78 | 78 | 100 | Yes | All of 18 | (1) |
| 6 | RON 95 <10 ppm S | 5 | 79.7% | 0 | 0 | | | | |
| 11 | RON 98 <50 ppm S | | 0.1% | 0 | 0 | | | | |
| 12 | RON 98 <10 ppm S | 12 | 1.9% | 15 | 13 | 2 | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **93** | **91** | **105** | Yes | All of 18 | |
| 14 | Diesel <50 ppm S | 14 | 33.8% | 41 | 18 | 100 | Yes | All of 5 | |
| 15 | Diesel <10 ppm S | 15 | 66.2% | 39 | 54 | | Yes | All of 5 | |
| **D** | **Total Diesel** | | **100%** | **80** | **72** | **100** | Yes | All of 5 | |

**Notes:** S = Summer; W = Winter
(1) Production of Petrol 91 RON has been stopped in the winter season of 2006. During January and February 2007 was sold out Petrol 91 RON, which was stored in the terminals.

### 25.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* In five samples the RON value was below the minimum limit value of 95, with values of 94.2, 94.2, 94.2, 94.4 and 94.5. Three samples gave a MON value below the minimum limit of 85 with values of 83.7, 84.3 and 83.1.

The limit value for vapour pressure (60 kPa) was exceeded by 1 sample, with 63.8 kPa.

3 samples exceeded the Olefins maximum of 18 % (v/v) with values of 25.8 % (v/v), 21.4 % (v/v) and 29.6 % (v/v), whereas one sample exceeded the benzene value of 1%v/v with 1.7 % (v/v).

*Statistical significance:* The tolerance limit for statistical significance for the RON test method is 94.6, for MON it is 84.5 and therefore these eight samples were below tolerance limits and so non-compliant with the Directive.

Summer vapour pressure tolerance limit is 61.8 kPa, for Olefins is 20.7 % (v/v) and for benzene is 1.1 %v/v. Therefore these samples were non-compliant with the Directive.

*Member State's notes:* In cases, where test results breached tolerance limits, the pertinent refuelling station owner ("dealer") was penalised by the Slovak Inspectorate of the Environment (S.I.E.).

***RON 98 Petrol***

| | |
|---|---|
| *Detail:* | The RON value of one sample was below the minimum limit value of 98 with value of 97.1, although limiting value for this petrol type is not reported in Directive 98/70/EC.<br><br>Three samples exceeded the maximum vapour pressure limiting values giving readings of 63.9, 62.2 and 62.2kPa. The maximum value for Aromatics was 37.7 % (v/v) and the maximum Oxygen content value of 2.82 % (m/m) exceeded limiting value of 2.7. |
| *Statistical significance:* | The tolerance limit for RON is 97.6 and therefore one sample was non-compliant with the national standard STN EN 228.<br><br>The Tolerance limit for summer vapour pressure is 61.8 kPa and the limit for aromatics is 37.2 % (v/v) therefore 4 samples were non-compliant with the Directive. |
| *Member State's notes:* | Dealer was penalised by the Slovak Inspectorate of the Environment. |

***Diesel < 50 ppm Sulphur***

| | |
|---|---|
| *Detail:* | One sample exceeded the limiting value for distillation, giving a reading of 362.7°C. |
| *Statistical significance:* | The tolerance limit for statistical significance for distillation is a maximum of 365.9°C and so the sample was compliant with the Directive. |

***Diesel < 10 ppm Sulphur***

| | |
|---|---|
| *Detail:* | One sample exceeded the limiting value for distillation, giving a reading of 363°C. |
| *Statistical significance:* | The tolerance limit for statistical significance for distillation is a maximum of 365.9°C and so the sample was compliant with the Directive. |

## 25.3 Temporal trends

Figure 25.2 to Figure 25.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales.

**Figure 25.2: Temporal trends in national sales of petrol and diesel (million litres)**

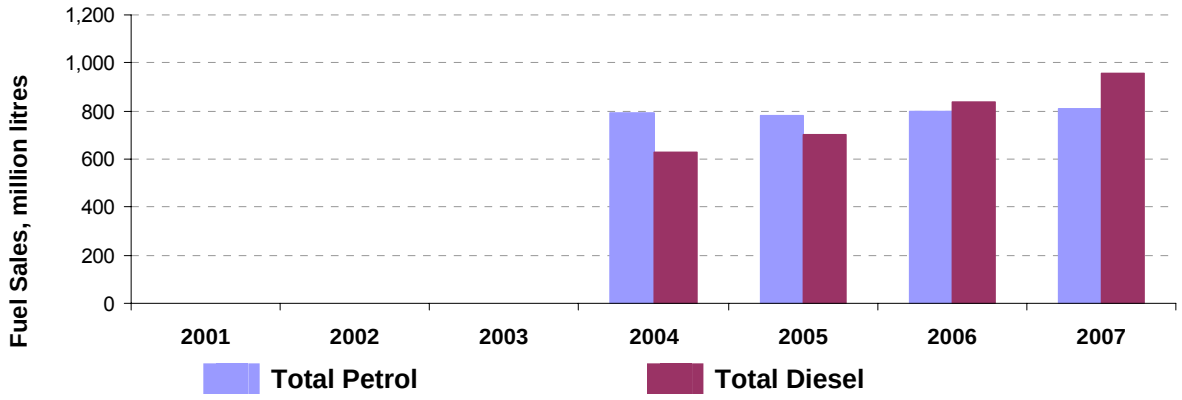



**Figure 25.3: Temporal trends in national sales of low sulphur petrol (%)**

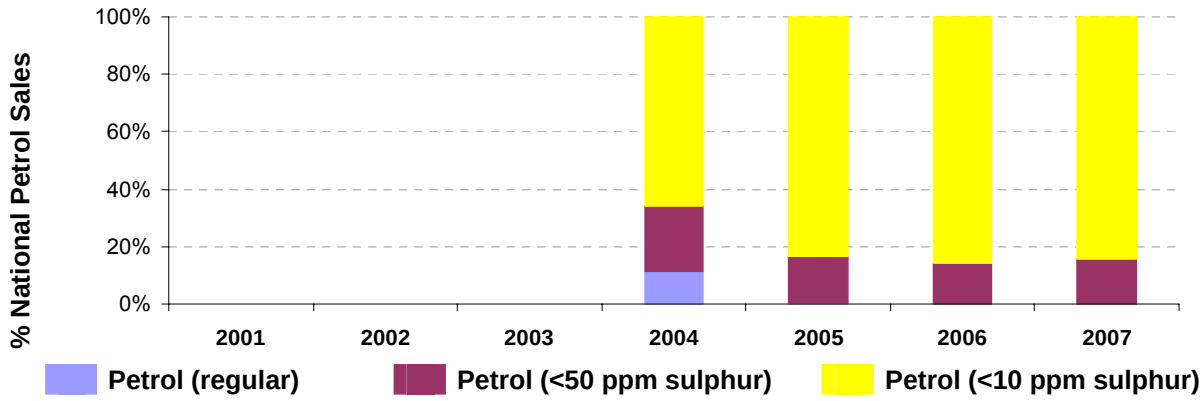



**Figure 25.4: Temporal trends in national sales of low sulphur diesel (%)**

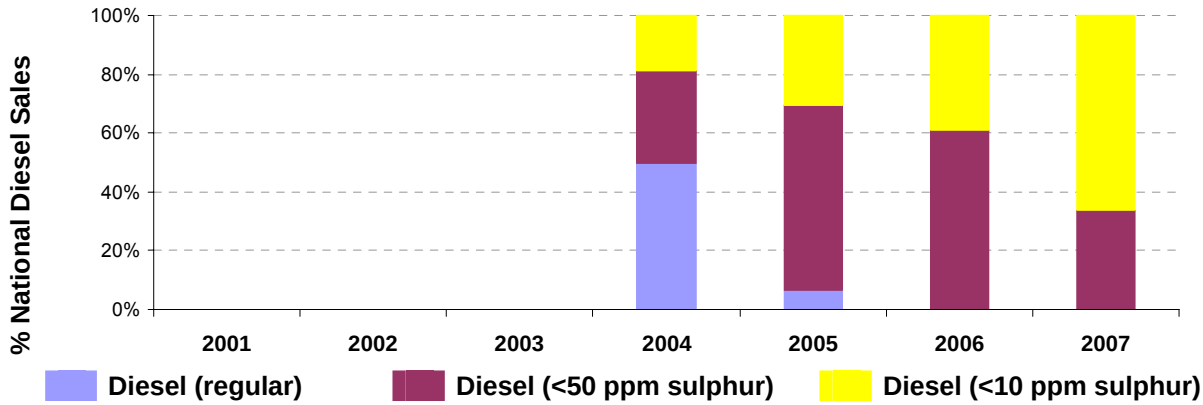
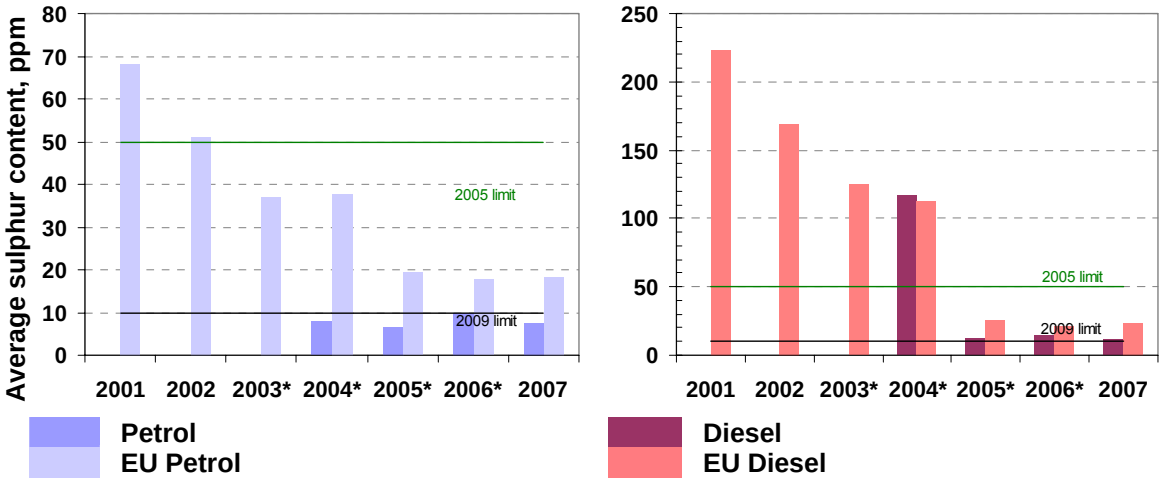



Figure 25.5 shows the trend in the average sulphur content of petrol and diesel fuels in Slovakia compared with the EU average (derived from sample analysis results and relative sales).

The shift to low-sulphur and sulphur-free fuels resulted in a significant reduction in sulphur content since 2005. The average sulphur content of petrol and diesel was well below the 2005 limit of 50ppm and also below the EU average in 2007. Additionally, for both petrol and desiel fuels in 2007 the average sulphur content was also below the forthcoming 2009 limit (10ppm).

**Figure 25.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 25.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Slovakia has stated that it uses Statistical Model C, however this does not appear entirely consistent with the European Standard specification (discussed in section 2.2.2). Instead statistical Model A seems more appropriate on the basis of the NUTS regional classification, which would require further information to be reported on sample numbers in different regions. Slovakia should present a clear rationale for Model C use on the basis of both number of fuel sources/supply points and country size /possibility of division of the territory into regions.<br>• Slovakia has not met the requirement with Statistical Model C to test samples of RON91 fuel. |

# 26 Slovenia

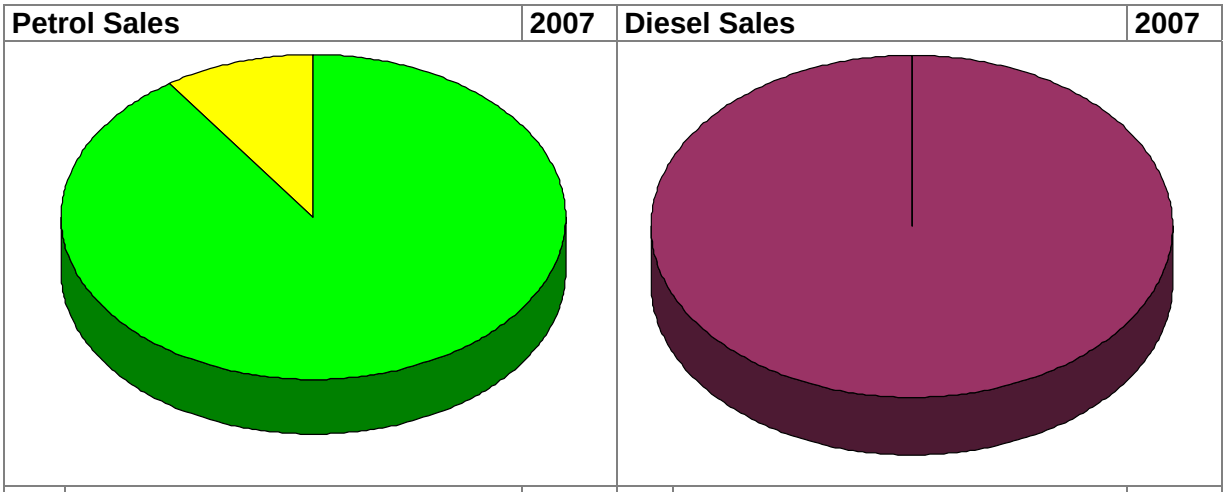
## 26.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 8 | 95<RON<98 | <50 ppm | NMB 95 EURO SUPER | 8 |
| 11 | RON 98 | <50 ppm | NMB 98 SUPER PLUS | 11 |
| 14 | Diesel | <50 ppm | Diesel | 14 |

### 26.1.1 Sales

**Figure 26.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 90.2% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 9.8% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 26.1 shows data for the three official national fuel grades in Slovenia, which are all low sulphur (<50ppm) grades. The majority of petrol sold was of RON 95 category (90.2%) a slight increase on sales of RON 98 (9.8%) since 2006. In addition to the three low sulphur grades, small amounts of sulphur free (<10ppm) petrol and diesel were also sold in 2007, as outlined in the following section.

### 26.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Considerable quantities of Unleaded petrol (minimum RON >=98 &< 10 ppm Sulphur), Unleaded petrol (minimum 95 =< RON < 98 & < 10 ppm Sulphur) and Diesel fuel (< 10 ppm sulphur) were sold in Slovenia in year 2007. The data of sulphur-free fuels were provided by oil distributors. There are however only three official national fuel grades in Slovenia.

One of the biggest liquid fuels distributors is already selling all fuels with the S amount < 10 ppm. Another major distributor is selling all Petrol RON >=98 with the S amount < 10 ppm. In Slovenia the total amount of Petrol RON =>98 and RON=95 with S < 10 ppn was >=24552 tonnes and >15842 tonnes, while the total Diesel fuel sale with S amount < 10 ppm was 46453 tonnes.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes, there are clear labels indicating the S amount at refuelling services (at delivery pipes), and on the receipts of fuel - according to our Decree on physical and chemical properties of liquid fuels.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No.

***Average sulphur content of all petrol and diesel sold:*** Table 26.1 shows the average content of fuel sold in relation to the EU25 average.

***Additional information:***

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 26.1: Annual trend in average sulphur content in petrol and diesel fuels**

| SI | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | | | | 39 | 27 | 26 | 23 | 18 |
| *Diesel* | | | | 236 | 47 | 43 | 28 | 23 |

## 26.2 Fuel Quality Monitoring 2007

### 26.2.1 Description of system

***Responsible organisation(s):*** Environmental Agency of the Republic of Slovenia.

***Format of Fuel Quality Monitoring System (FQMS):*** EN 14274 Statistical Model C.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Samples of petrol were taken at refuelling stations and samples of diesel were taken at refuelling stations and depots.

***Time/frequency of sampling:*** Samples of petrol were taken at refuelling stations each month across the winter and summer periods. Samples of Diesel fuel were taken each month throughout the year.

***Specification of test methods:*** The test methods were in compliance with the Directive specifications, except for determination of lead and cetane number. Validation and traceability of both methods were provided according to EN ISO/IEC 17025:2005.

***Collection of sales data:*** The Statistical Office of the Republic of Slovenia, fuel distributors and independent inspection bodies provided the national sales data.

### 26.2.2 Sampling and reporting

Slovenia was fully compliant with the sampling and reporting requirements in 2007. The following Table 26.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 26.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement (1) | | | |
| 8 | 95<RON<98 <50 ppm S | 8 | 90.2% | 54 | 60 | 100 | Yes | All of 18 | |
| 11 | RON 98 <50 ppm S | 11 | 9.8% | 11 | 14 | 10 | Yes | All of 18 | |
| **P** | **Total Petrol** | | **100%** | **65** | **74** | **110** | | All of 18 | |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 64 | 90 | 100 | Yes | All of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **64** | **90** | **100** | | All of 5 | |

**Notes:** S = Summer; W = Winter
(1) Two Sulphur samples reported as non-compliant with the Directive with a maximum value of 349 mg/kg

### 26.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

*Detail:* The limiting values for RON (Minimum 95), summer Vapour Pressure (maximum 60 kPa) and Aromatics (maximum 35 % (v/v) were exceeded. The limiting value of .005 g/l for lead was also exceeded by at least one sample.

*Statistical significance:* The RON and Aromatic values of 94.8 and 36.2 % (v/v) respectively, were within tolerance limits and were therefore compliant with the Directive.

The tolerance limit for statistical significance for the test methods used is 61.8 kPa for summer vapour pressure, therefore at least one sample was non-compliant with the Directive, with a value of 81.7kPa. Lead content in at least one sample was also non-compliant with the Directive, with a maximum value of 3g/l.

*Member State's notes:* Summer vapour pressure of max. 60 kPa were exceeded by 3 samples respectively (for all petrol).

The sulphur content limit value (of max. 50 mg/kg) was NOT exceeded by any sample.

The test methods were in compliance with the Directive specifications, except for determination of lead and cetane number.

Validation and traceability of both methods were provided according to EN ISO/IEC 17025:2005.

The information of the limit exceedance was delivered to the Inspectorate of the Republic of Slovenia for the Environment and Spatial Planning, and to the Market Inspectorate of the Republic of Slovenia. According to the national legislation which transposes the Directive 98/70/EC, and was amended in June 2006, the distributors will be penalised as a result of the exceedance.

***RON 98 Petrol***

*Detail:* Results show that limiting values for summer vapour pressure of 60kPa, Distillation evaporated at $150^0$C, minimum 75 % (v/v), Aromatics (maximum 35 % (v/v) and lead content were all exceeded by at least one sample.

*Statistical significance:* Summer vapour pressure, at least one value of 72.7kPa, Distillation (150) at least one value of 53.5 % (v/v) and Lead Content with at least one at 3g/l. These samples were therefore non-compliant with the Directive. Therefore the samples exceeded the tolerance limit for statistical significance and were non-compliant with the Directive.

*Member State's notes:* As for RON 95.

***Diesel***

*Detail:* Cetane value (49.4) was below the minimum limit value of 51.

The sulphur content limit value of 50 mg/kg was exceeded by 2 samples, with at least one sample reaching a maximum of 349 mg/kg.

*Statistical significance:* The cetane tolerance limit is minimum 48.5, therefore the samples were compliant with the Directive.

The sulphur content tolerance limit is 54.7 mg/kg; therefore samples were not compliant with the Directive.

*Member State's notes:* The sulphur content value (of max. 50 mg/kg) was exceeded by 2 samples. The information of the limit exceedance was delivered to the Inspectorate of the Republic of Slovenia for the Environment and Spatial Planning, and to the Market Inspectorate of the Republic of Slovenia. According to the national legislation, which transposes the Directive 98/70/EC, and was amended in June 2006, the distributors will be penalised as a result of the exceedance.

The test methods were in compliance with the Directive specifications, except for determination cetane number. Validation and traceability was provided according to EN ISO/IEC 17025:2005.

## 26.3 Temporal trends

The following Figure 26.2 to Figure 26.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Petrol sales decreased from 2004 to 2007 by 8.5%, whereas diesel sales increased by 52.7%.

**Figure 26.2: Temporal trends in national sales of petrol and diesel (million litres)**

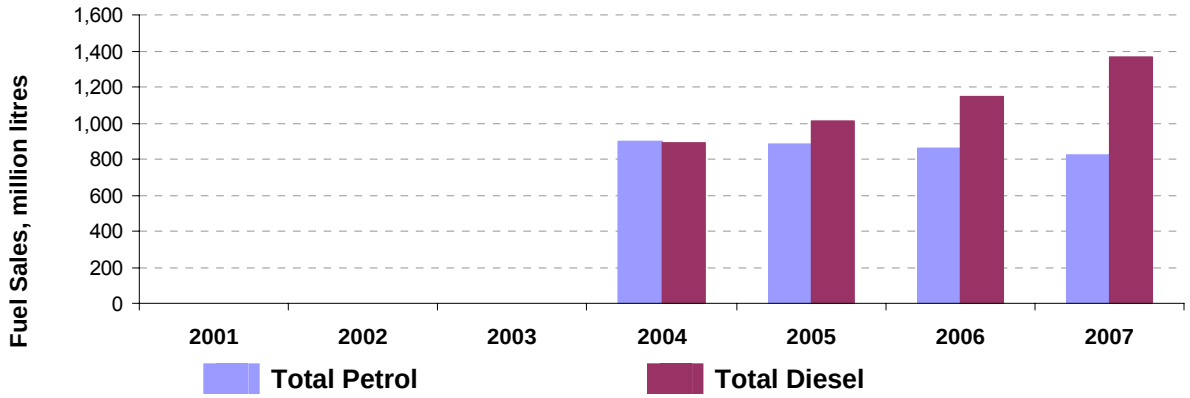



**Figure 26.3: Temporal trends in national sales of low sulphur petrol (%)**

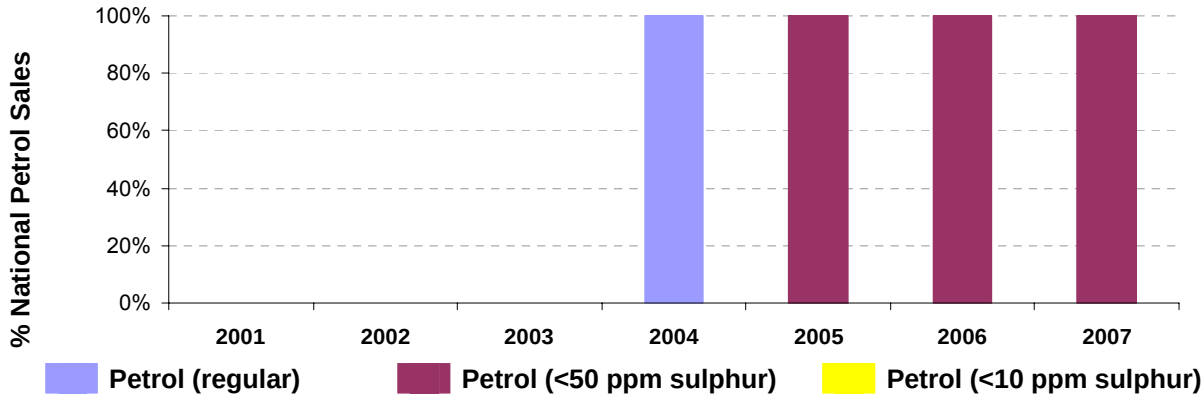



**Figure 26.4: Temporal trends in national sales of low sulphur diesel (%)**

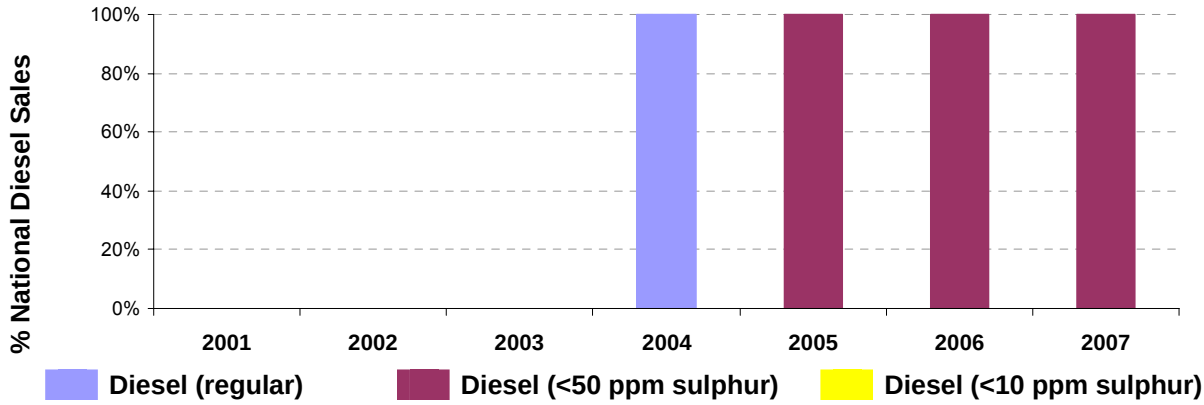
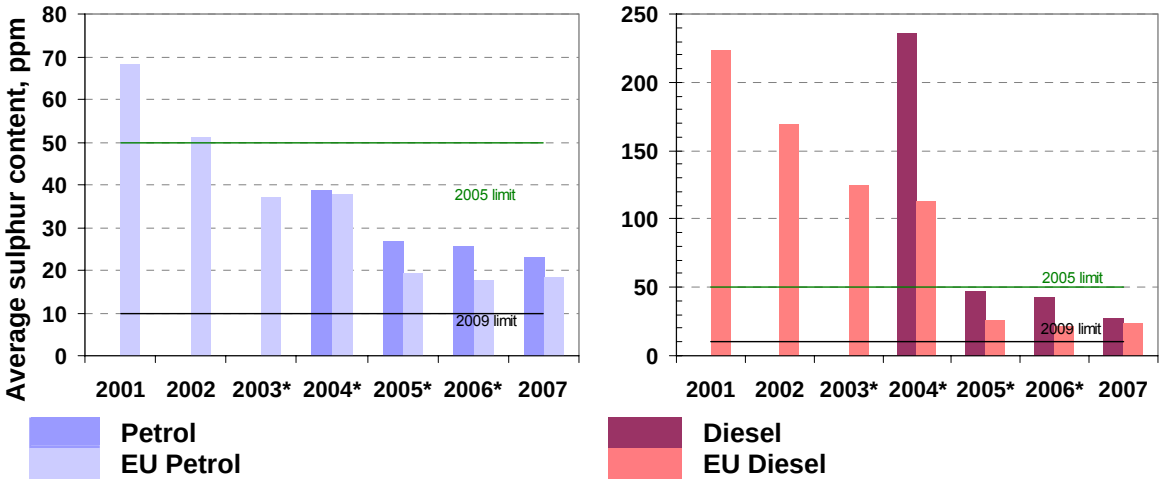



Figure 26.5 shows the trend in the average sulphur content of petrol and diesel fuels in Slovenia compared with the EU average (derived from sample analysis results and relative sales).

The shift to low-sulphur fuels resulted in a significant reduction in sulphur content since 2005. The average sulphur content of petrol and diesel was well below the 2005 limit of 50ppm but above the EU average in 2007.

**Figure 26.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 ans Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 26.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The number of samples with non-compliant values for each parameter in each grade have not been given by Slovenia. This information has been given in combination for the two petrol fuel grades.<br>• The test methods were in compliance with the Directive specifications, except for determination of lead and cetane number. Validation and traceability of both methods were provided according to EN ISO/IEC 17025:2005. |

# 27 Spain

## 27.1 Fuel Availability 2007

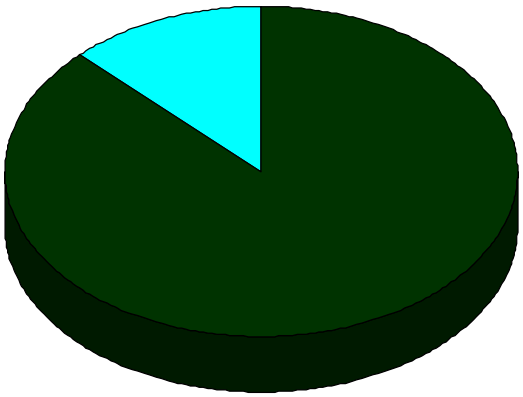
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

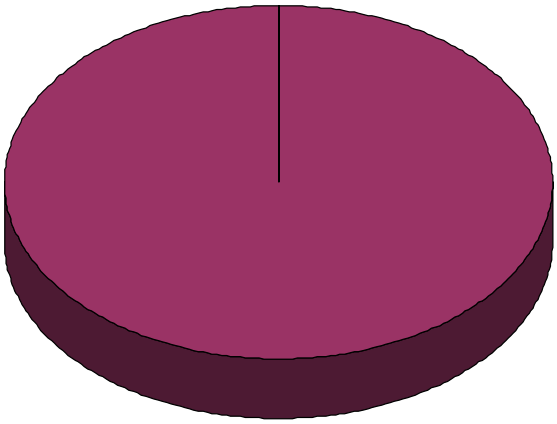
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Gasolina sin plomo (95 I.O.) | 5 |
| 12 | RON 98 | <10 ppm | Gasolina sin plomo (98 I.O.) | 12 |
| 14 | Diesel | <50 ppm | Gasóleo de automoción | 14 |
| 15 | Diesel | <10 ppm | Gasóleo de Automoción sin azufre | 15 |

### 27.1.1 Sales

**Figure 27.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 100.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | - |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 87.4% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 12.6% | | | |

Figure 27.1 shows that the majority of fuel sold in Spain in 2007 was again RON 95 grade and has decreased by 3.5% (RON 95: 6053 kTm in 2006 and 5847 kTm in 2007) of market

share since 2006 and overall sales of Petrolo in Spain have decreased, with the remaineder comprising of RON>98 (12.6%). No sulphur-free diesel sales figures were available.

Samples have been analysed for Diesel national Grade Gasóleo de Automoción sin azufre (Diesel (<10 ppm sulphur), although no sales data have been given for this grade of fuel. Compliance with the Directive has been analysed based on the separate results for this fuel grade (Sulphur <10ppm) given by Spain.

### 27.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Petrol RON> = 98 have all sold sulphur content <10 ppm.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes.

**Are the sample analysis results for sulphur content of sulphur-free grades reported separately?** Yes.

***Average sulphur content of all petrol and diesel sold:*** Average sulphur content of petrol and diesel in Spain has varied little between 2001 and 2004, but then decreased significantly with the introduction of the <50 ppm limit and <10ppm fuels in 2005 - see Table 27.1.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 27.1: Annual trend in average sulphur content in petrol and diesel fuels**

| ES | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 96 | 103 | 103 | 100 | 23 | 17 | 25 | 18 |
| *Diesel* | 278 | 276 | 267 | 253 | 33 | 26 | 35 | 23 |

## 27.2 Fuel Quality Monitoring 2007

### 27.2.1 Description of system

***Responsible organisation(s):*** Gen. Directorate for Energy Policy and Minas.Ministerio of Industry, Tourism and Trade.

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Large (more than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st May to 30th September (Normal).

***Location(s) of sampling:*** Refuelling stations, Terminals / Depots and Refineries.

***Time/frequency of sampling:*** Monthly throughout the year (excluding April, May and September, October for all petrol and diesel fuel grades).

***Specification of test methods:*** No information provided.

***Collection of sales data:*** No information provided.

**Other details:** The compilation of the summaries of data on the quality of fuel has been made based on samples collected at the exit of vehicle storage facilities owned Hydrocarbons Logistics Company, CLH, SA (leading Spanish logistics of petroleum products

with a market share of around 80%), located throughout the country. These data were compared with samples taken at the end of supply of the Autonomous Communities.

The analysis of these samples have been carried out in laboratories in the regions, as well as the Center for Research and Quality Control of the National Consumer Agency of the Ministry of Health and Consumer Affairs, and in the laboratory Logistics Company Hydrocarbons, CLH, SA

In Spain there is a total of 9 refineries, which supply the national market with a total processing capacity of crude oil, 65 MTM / year.

### 27.2.2 Sampling and reporting

Spain was compliant with the sampling and reporting requirements in 2005, although it has not provided information on whether its national monitoring system is equivalent in confidence with the requirements of EN 14274. The following Table 27.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 27.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement[1] | | | |
| 5 | RON 95 <50 ppm S | 5 | 87.4% | 94 | 152 | - | Yes | All of 18 | (1) |
| 8 | 95<RON<98 <50 ppm S | | 0.0% | 0 | 0 | - | | | (1) |
| 12 | RON 98 <10 ppm S | 12 | 12.6% | 91 | 148 | - | Yes | All of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **185** | **300** | **-** | | | |
| 14 | Diesel <50 ppm S | 14 | 100.0% | 97 | 160 | - | Yes | All of 5 | (1) |
| 15 | Diesel <10 ppm S | 15 | 0.0% | 40 | 61 | - | Yes | All of 5 | (1) |
| **D** | **Total Diesel** | | **100%** | **137** | **221** | **-** | | | |

**Notes:** S = Summer; W = Winter
(1) No information was provided on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274

### 27.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***RON 95 Petrol***

All samples tested were in compliance with limit values.

***RON 98 Petrol***

All samples tested were in compliance with limit values.

***Diesel < 50 ppm***

All samples tested were in compliance with limit values.

***Diesel < 10 ppm***

All samples tested were in compliance with limit values.

## 27.3 Temporal trends

Figure 27.2 to Figure 27.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Petrol sales at decreased by 21% between 2001 and 2007, with diesel sales increasing by 42%. Sulphur-free fuels were introduced for the first time in 2005.

**Figure 27.2: Temporal trends in national sales of petrol and diesel (million litres)**

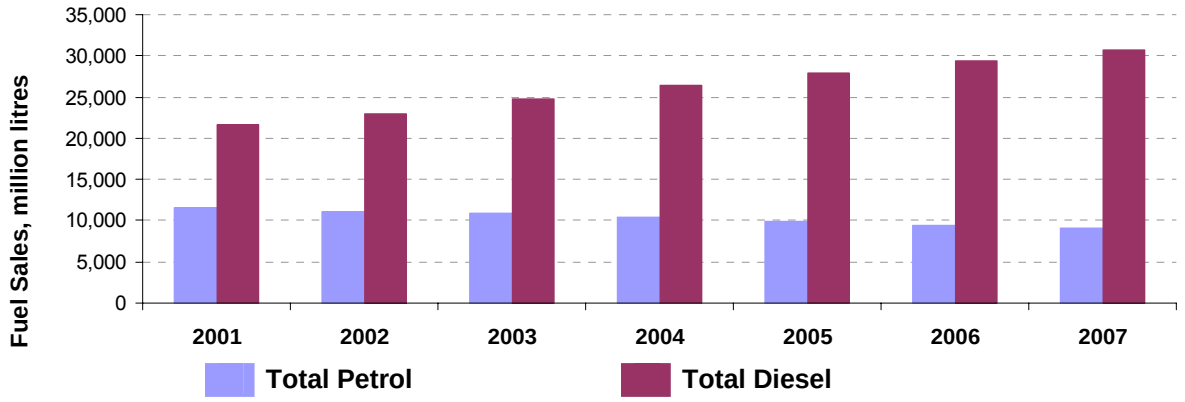



**Figure 27.3: Temporal trends in national sales of low sulphur petrol (%)**

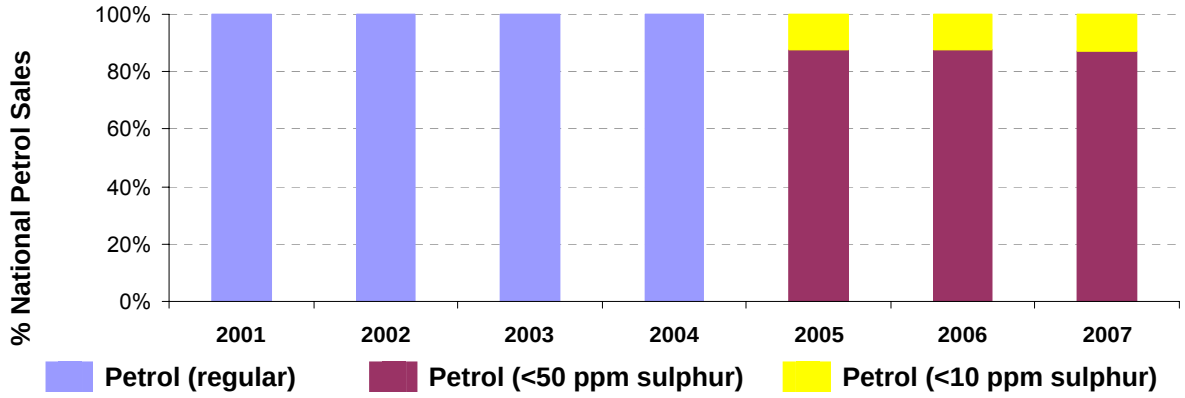



**Figure 27.4: Temporal trends in national sales of low sulphur diesel (%)**

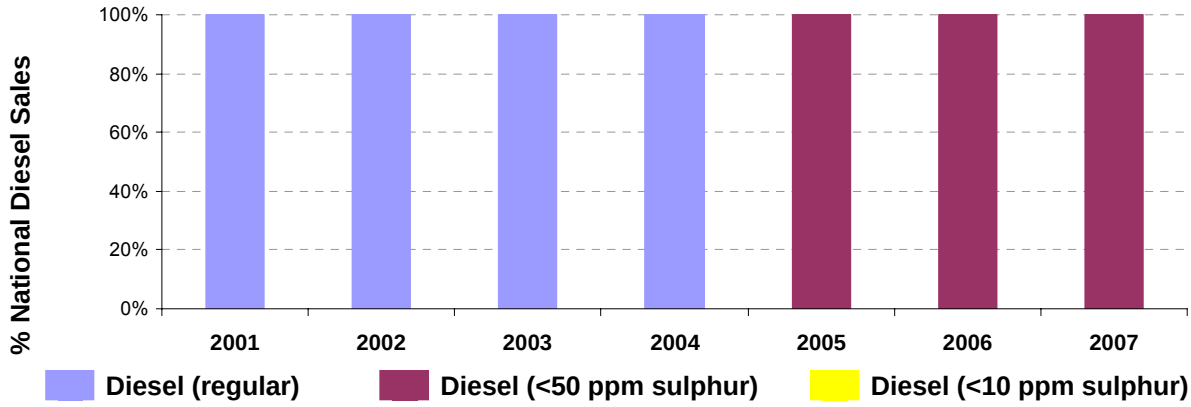
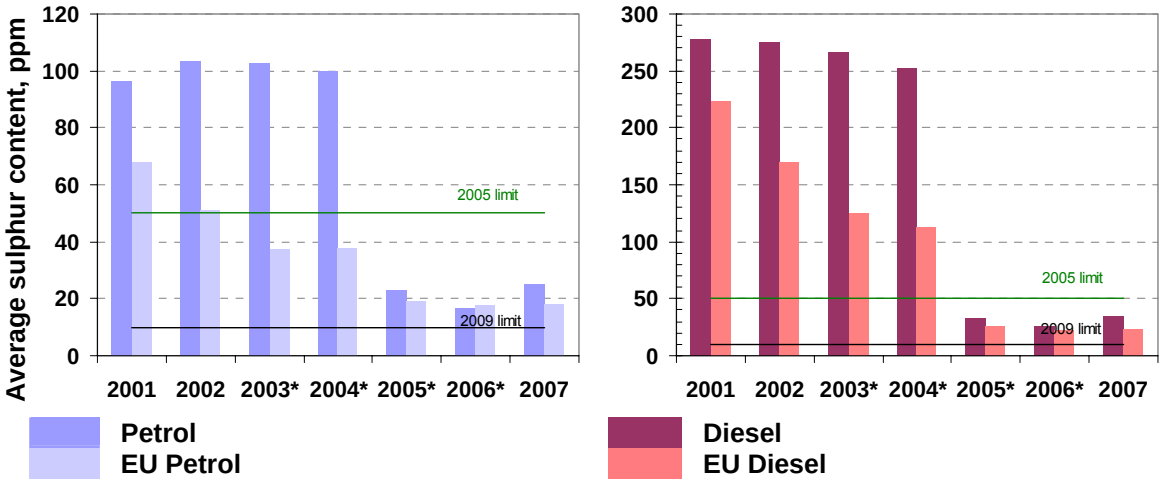



Figure 27.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). The average sulphur content of both petrol and diesel fuels has decreased steadily since 2001,

with a substantial decrease with the introduction of the mandatory limit of <50ppm and sulphur-free fuels in 2005. Average sulphur content was above the EU average in 2007 for both petrol and diesel fuels.

**Figure 27.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 27.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Spain has not provided information on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274.<br>• Spain is carrying out sampling at refineries and depots as well as refuelling stations. Information on sample numbers taken from refuelling stations would help assessment of its national FQMS comparability with EN 14274.<br>• Sales of sulphur free diesel are not provided and Spain has provided no assessment of the geographical availability of sulphur-free diesel in its territory. |

# 28 Sweden

## 28.1 Fuel Availability 2007

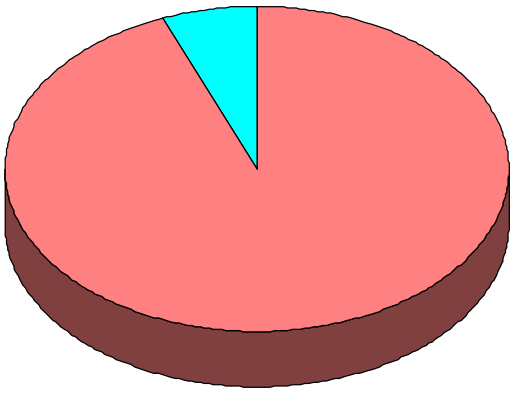
The following table lists the fuels that were reported to be available nationally in 2007 and the category (the reference number) under which sample analysis results were reported.

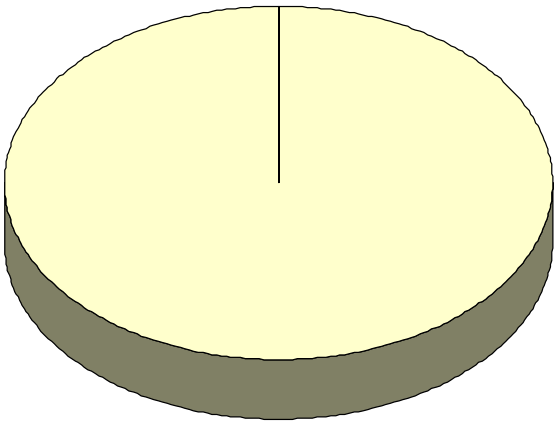
| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 6 | RON 95 | <10 ppm | Class 1 petrol unleaded 95 | 6 |
| 12 | RON 98 | <10 ppm | Class 1 petrol unleaded 98 | 12 |
| 15 | Diesel | <10 ppm | Environmental class 1 diesel | 15 |

### 28.1.1 Sales

**Figure 28.1: National fuel sales volume proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | - |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 100.0% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 93.9% | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 6.1% | | | |

Figure 28.1 shows that all petrol sold in Sweden in 2007 was sulphur-free (<10 ppm), 93.9% being RON 95 (which has increased in 2006 and 2007 from 93% in 2005) and 6.1% RON 98. All diesel sold was also sulphur-free grade (<10 ppm).
Note: Diesel fuel sales include also fuel for off road use - Sweden has the same grade on road as well as off road diesel fuel.

### 28.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** All petrol and diesel fuel sold throughout Sweden is sulphur free.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Yes.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** N/A.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol has decreased since 2001 but seen an increase from 1 ppm to 2 ppm for diesel, remaining well below the limit of 10 mg/kg, see Table 28.1.

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 28.1: Annual trend in average sulphur content in petrol and diesel fuels**

| **SE** | | **Average Sulphur Content, ppm** | | | | | | **EU27** |
|---|---|---|---|---|---|---|---|---|
| **Fuel/Year** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2007** |
| ***Petrol*** | 21 | 17 | 13 | 9 | 4 | 3 | 4 | 18 |
| ***Diesel*** | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 23 |

## 28.2 Fuel Quality Monitoring 2007

### 28.2.1 Description of system

***Responsible organisation(s):*** The Swedish Road Administration with assistance from The Swedish Petroleum Institute and Oil companies.

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Small (less than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions).

***Location(s) of sampling:*** Sampling taken at refineries and terminals.

***Time/frequency of sampling:*** Sampling taken full year – every batch from the refineries and all imports of fuel. No breakdown of sampling per month has been reported.

***Specification of test methods:*** No information has been provided by Sweden on test methods.

***Collection of sales data:*** Reported by the major oil companies in the market.

***Other details:*** The reporting is based on: for petrol 95 octane: 4 820 894 m3, which is 98% of total sales; for petrol 98 octane: 336 706 m3, which is 99 % of total sales; Diesel data is based on 85% of sold volume. Three national refineries and a number of international refineries supply the market in Sweden. The number of sources of imported fuels by petrol/Diesel breakdown is: Petrol: 3 national refineries and a number of international refineries and Diesel: 3 national refineries and 2 Scandinavian refineries.

### 28.2.2 Sampling and reporting

As in 2006, Sweden was not compliant with the sampling and reporting requirements in 2007, as the national system does not involve sampling at refuelling stations, as required by EN 14274. Sampling at refuelling stations is a prerequisite criterion in establishing similar confidence to this standard. The following Table 28.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 28.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement | | | |
| 6 | RON 95 <10 ppm S | 6 | 93.9% | 370 | 344 | - | Yes | 11 of 18 | (1) |
| 12 | RON 98 <10 ppm S | 12 | 6.1% | 110 | 75 | - | Yes | 11 of 18 | (1) |
| **P** | **Total Petrol** | | **100%** | **480** | **419** | **-** | **Yes** | **11 of 18** | **(1)(3)** |
| 15 | Diesel <10 ppm S | 15 | 100.0% | 675 | 0 | - | No | 5 of 5 | (2) |
| **D** | **Total Diesel** | | **100%** | **675** | **0** | **-** | **No** | **5 of 5** | **(2)(3)** |

**Notes:** S = Summer; W = Winter

(1) For RON95 petrol: Oxygen content and six of the seven oxygenates have not been reported. For RON98 petrol: Six of the seven oxygenates (ie other than ethers with more than 5 carbon atoms per molecule) have not been reported. Member State comments: "Ethanol is added at the gantry but also at refineries. Therefore the DVPE is a mix of both with and without ethanol. The addition of Ethanol of up to 5% increases the DVPE with about 7 kPa. The oxygen content is not available in the finished fuel"

(2) No sampling details for summer and winter period available for Diesel, this is because Sweden has the same diesel fuel quality year around and so there is no difference in quality between summer and winter. The values reported by Sweden are for the year-round diesel quality.

(3) No information was provided on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274

### 28.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol***

As per 2006, all Petrol samples tested were in compliance with limit values and tolerance limits and were therefore compliant with the Directive.

***Diesel***

| | |
|---|---|
| Detail: | In one or more samples, the cetane number of 50 was below the minimum limit value of 51.0. |
| *Statistical significance:* | The sample/s were within the minimum tolerance limit of 48.5, and were thus compliant with the Directive. |
| *Member States Notes:* | The reported figures are for cetane index not cetane number. The national limit for cetane index is a minimum of 50 for the Swedish class 1 diesel fuel. |

## 28.3 Temporal trends

Figure 28.2 to Figure 28.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Petrol sales decreased by 3% between 2001 and 2007, whereas diesel sales have increased by 32%. All petrol sold in 2001 - 2004 was low sulphur (<50 ppm), with full market conversion to sulphur-free from 2005 onwards. All diesel fuel sold in Sweden since 2001 has been sulphur free (<10 ppm).

**Figure 28.2: Temporal trends in national sales of petrol and diesel (million litres)**

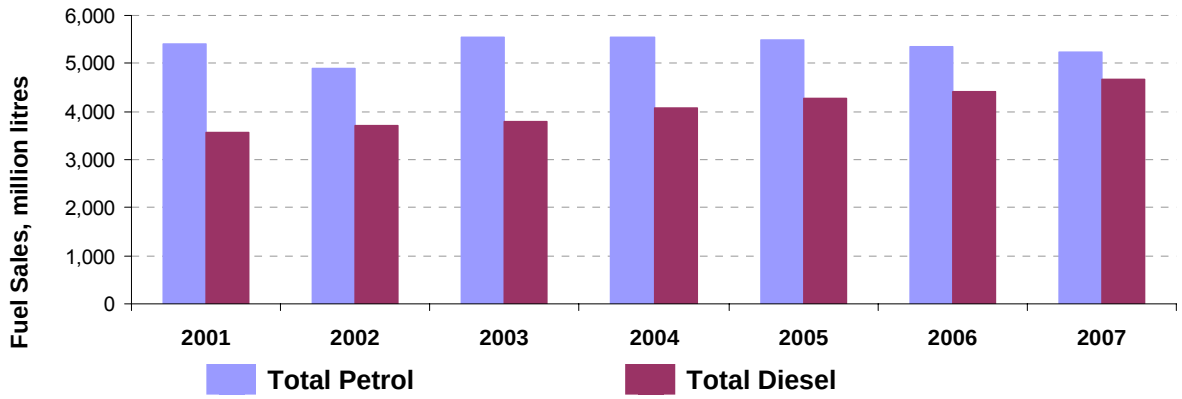



**Figure 28.3: Temporal trends in national sales of low sulphur petrol (%)**

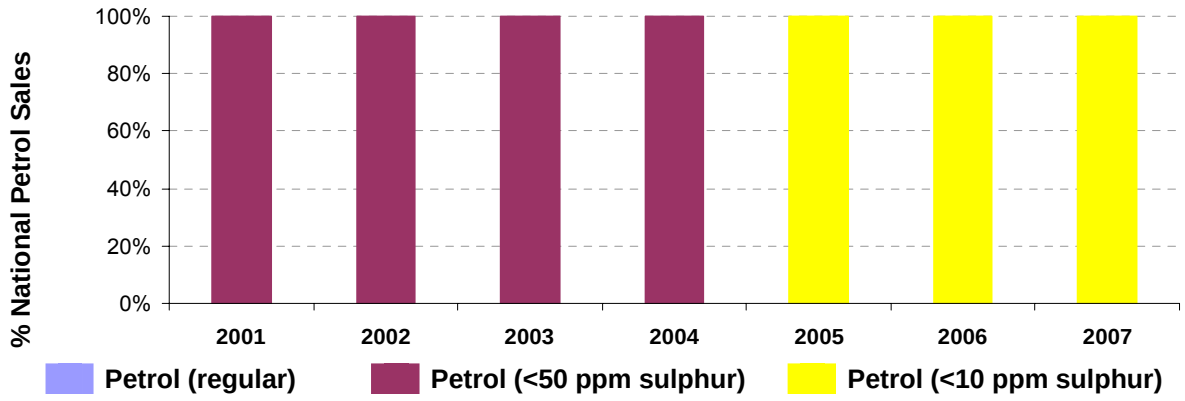



**Figure 28.4: Temporal trends in national sales of low sulphur diesel (%)**

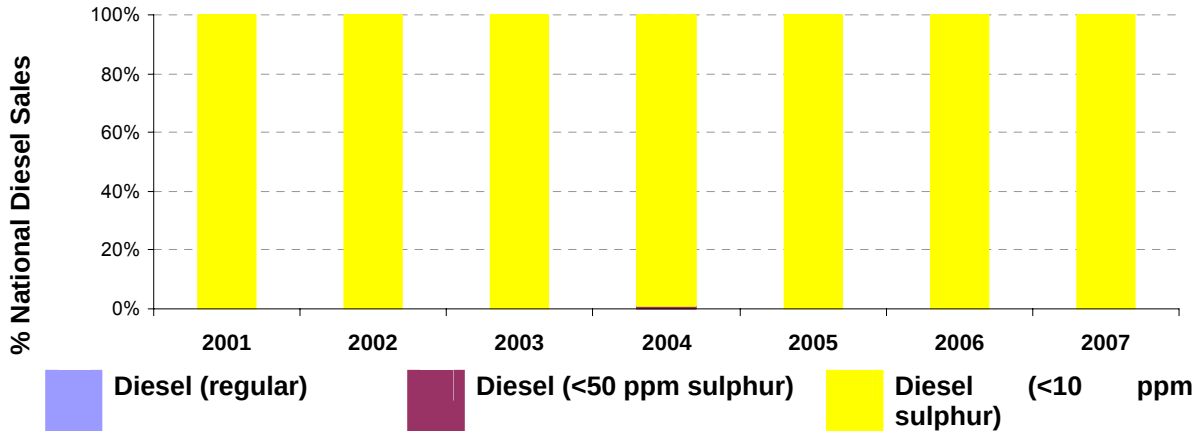
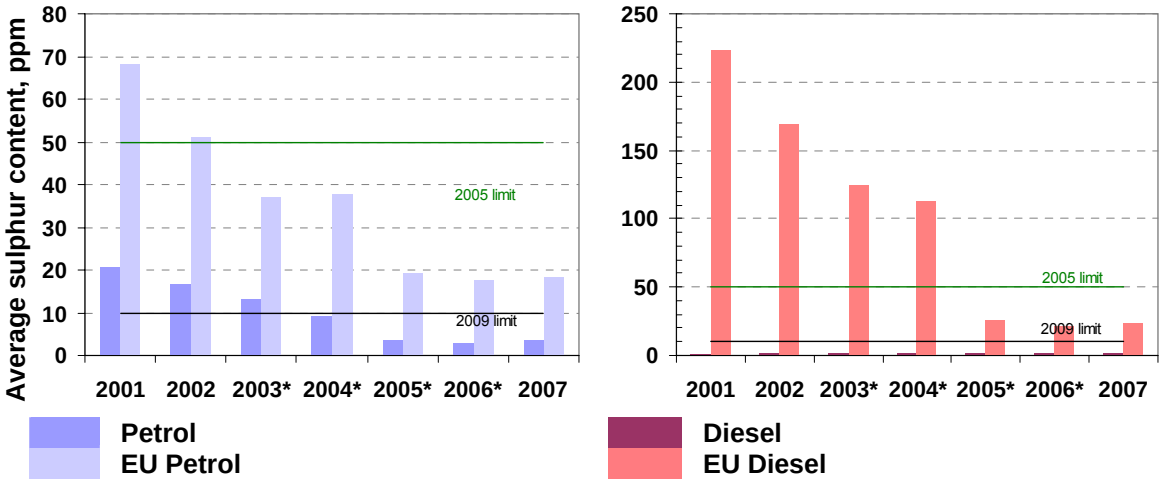



Figure 28.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). The

average sulphur content of petrol fuels has decreased slowly since 2001 and are well below the mandatory <50ppm limits, the EU average and the 2009 <10 ppm limits. The average sulphur content for diesel fuels has remained at the same level since 2001, which is well below the 2005 level, the EU average and the forthcoming 2009 limit.

**Figure 28.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 28.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • Sweden has not provided an explanation for utilising a national FQMS in place of the European Standard or its statistical equivalence to the standard.<br>• Sweden only carries out sampling at refineries and depots, with no samples taken at fuel dispensing sites – which is a prerequisite requirement for statistical confidence comparable to EN 14274.<br>• Sweden's current system provides no assurance that fuel dispensed at the pumps has not been tampered with since it left the refinery/depot.<br>• Results for summer and winter periods should be reported separately for the diesel fuel grade, as was done for the two petrol fuel grades, although this is due to the fact that Sweden has the same diesel fuel quality for the winter period as for the summer period. |

# 29 United Kingdom

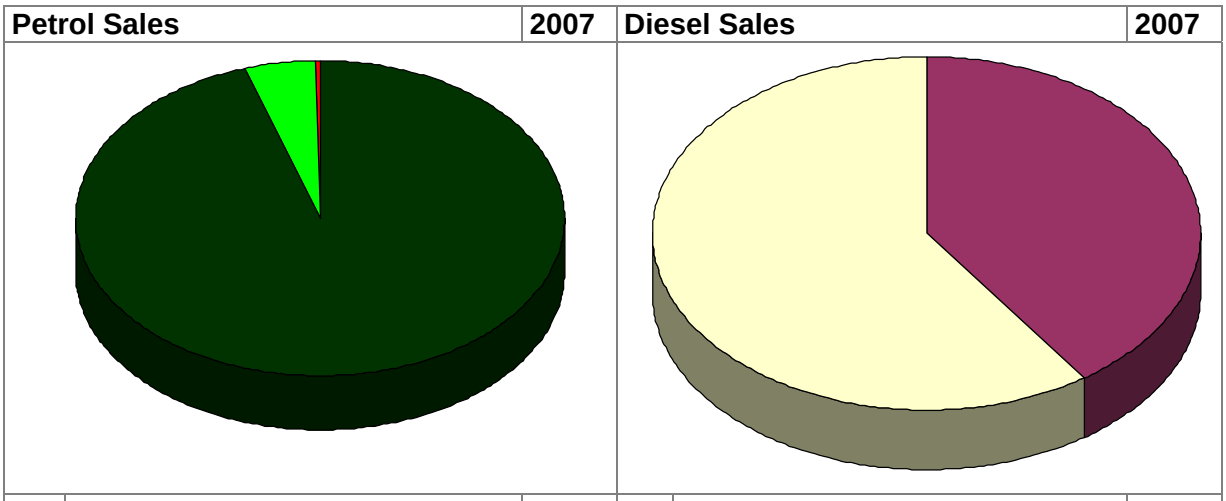
## 29.1 Fuel Availability 2007

The following table lists the fuels that were reported to be available nationally in 2006 and the category (the reference number) under which sample analysis results were reported.

| Reference Number | Fuel grade | Sulphur Content | National fuel grade | Reporting Category |
|---|---|---|---|---|
| 5 | RON 95 | <50 ppm | Premium Unleaded | 5 |
| 8 | 95<RON<98 | <50 ppm | Super Unleaded/LRP | 8 |
| 9 | 95<RON<98 | <10 ppm | Super Unleaded/LRP (<10ppm) | 8 |
| 14 | Diesel | <50 ppm | ULSD | 14 |
| 15 | Diesel | <10 ppm | SFD | 14 |

### 29.1.1 Sales

**Figure 29.1: National fuel sales volume proportions by fuel type (%)**




| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | 13 | Diesel | - |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 14 | Diesel (<50 ppm sulphur) | 40.3% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 15 | Diesel (<10 ppm sulphur) | 59.7% |
| 4 | Unleaded petrol min. RON=95 | - | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 94.9% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | | | |
| 7 | Unleaded petrol 95=<RON<98 | - | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 4.7% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | 0.4% | | | |
| 10 | Unleaded petrol RON>=98 | - | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | | | |

Figure 29.1 above shows the wide availability of low sulphur (<50 ppm) fuels on the UK market in 2007, with 100% of all petrol and diesel fuel sold being low sulphur, as in previous years. In contrast to 2006 reporting, the UK has reported sales figures for Diesel <10ppm

(59.7%) and Diesel <50ppm (40.3%) separately. Sampling analysis has been reported as combined sampling.

***Additional Information:***

Her Majesties Revenue and Customs (HMRC) data shows 92 million litres of sulphur free petrol was sold in 2007. This is equivalent to 0.068 million tonnes or 0.38% of petrol sales. Of this, 56 million litres was sold in Nov/Dec 2007, equivalent to 0.041 million tonnes or 0.23% of petrol sales. UK legislation reducing permitted sulphur levels to 10 ppm, came into force on 4 December 2007 for super unleaded petrol and diesel.

### 29.1.2 Sulphur content

***Geographical availability of sulphur-free fuels:*** Substantial investment has been made at UK refineries in anticipation of an early move to sulphur free fuels in the UK, in response to Budget announcements of UK Government policy. Enabling legislation, Statutory Instrument 2007 No 1608, giving effect to the further reduction of sulphur levels under Directive 2003/17/EC, was laid before Parliament on 5 June 2007. This came into force on 4 December 2007 for super unleaded petrol and diesel, and 1 January 2009 for premium unleaded petrol, reducing permitted sulphur levels to a maximum of 10 ppm.

***Are sulphur-free grades clearly labelled differently / marketed separately?*** Sulphur free grades are not separately labelled at service stations. Original Equipment Manufacturers (OEMs), the vehicle manufacturers, want the grade to be universally available before vehicles requiring sulphur free fuels are introduced.

***Are the sample analysis results for sulphur content of sulphur-free grades reported separately?*** No – diesel sulphur free grade sampling analysis results have been reported in combination with low sulphur diesel sampling analysis. The same approach was used for sulphur free petrol.

***Average sulphur content of all petrol and diesel sold:*** The average sulphur content of both petrol and diesel has decreased since 2001 (see Table 29.1).

*[Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold].*

**Table 29.1: Annual trend in average sulphur content in petrol and diesel fuels**

| UK | Average Sulphur Content, ppm | | | | | | | EU27 |
|---|---|---|---|---|---|---|---|---|
| Fuel/Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2007 |
| *Petrol* | 49 | 41 | 37 | 37 | 33 | 34 | 34 | 18 |
| *Diesel* | 40 | 40 | 38 | 35 | 33 | 19 | 14 | 23 |

## 29.2 Fuel Quality Monitoring 2007

### 29.2.1 Description of system

***Responsible organisation(s):*** UK Government Department of Energy and Climate Change (DECC)

***Format of Fuel Quality Monitoring System (FQMS):*** National System.

***Country Size:*** Large (more than 15 million tonnes automotive fuel dispensed per year).

***Summer Period:*** 1st June to 31st August (arctic or severe weather conditions).

***Location(s) of sampling:*** The UK fuel quality monitoring system makes use of industry quality analyses on every batch of fuel leaving UK refineries, plus samples taken at distribution terminals and forecourts (to check for contamination in the distribution network).

***Time/frequency of sampling:*** Refinery quality analyses on every batch of fuel produced in, or imported into, the UK, plus samples taken at distribution terminals and forecourts. Samples have been taken in each month throughout the year.

***Specification of test methods:*** Due to the very large number of samples involved, this approach provides an equivalent or greater, degree of confidence to EN 14274.

***Collection of sales data:*** Sales data are taken from national statistics collected by DECC and Her Majesty's Revenue and Customs and published in the DECC Digest of UK Energy Statistics.

***Other Details:*** Fuel sales data is provided in million litres and thousand tonnes.

## 29.2.2 Sampling and reporting

The United Kingdom was essentially compliant with the sampling and reporting requirements in 2007, and has provided information on the national monitoring system confidence level. However the Fuel Quality Analysis report was not submitted for the UK until 8 months after report submission date. The following Table 29.2 provides a summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC.

**Table 29.2: Summary of sampling and analyses carried out with respect to requirements of Directive 98/70/EC and EN 14274**

| Fuel Category | Fuel Grade | Analysis Reported in Category | % Sales | Samples | | | Separate S & W Report | Parameters Measured | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | S | W | Total EN 14274 Requirement (1) | | | |
| 5 | RON 95 <50 ppm S | 5 | 94.9% | 445 | 1332 | - | No | All of 18 | (1) |
| 8 | 95<RON<98 <50 ppm S | 8 | 4.7% | 73 | 196 | - | No | All of 18 | (1) |
| 9 | 95<RON<98 <10 ppm S | | 0.4% | 0 | 0 | - | | | |
| **P** | **Total Petrol** | | **100%** | **518** | **1528** | **-** | **No** | **All of 18** | **(1)** |
| 14 | Diesel <50 ppm S | 14 | 40.3% | 536 | 1635 | - | No | All of 5 | |
| 15 | Diesel <10 ppm S | 14 | 59.7% | 0 | 0 | - | | | |

**Notes:** S = Summer; W = Winter
(1) At least one sample exceeds the tolerance limit for Olefins

Of the 3,942 samples for which results were reported, 201 samples were collected from service stations (71 Premium Unleaded, 53 Super Unleaded/LRP and 77 Diesel).

## 29.2.3 Compliance with fuel quality limit values

***Non-compliance with Directive 98/70/EC limit values***

*(Details on the limit values, test methods and tolerance limits can be found in Appendix 2).*

***Petrol RON 95***

*Detail:*

One or more samples of RON and MON were below the minimum limit values of 95 and 85 respectively with minimum of 94.8 and 84.6. One sample exceeded the limiting values for vapour pressure (70kPa) with a maximum value of 70.9 kPa.

Olefins samples exceeded the maximum limit value of 18%v/v with 18.1%v/v and Aromatics exceeded the limiting value of a maximum of 35 %(v/v) with a sample of 35.8 % (v/v). One Sulphur values

exceeded the limiting value of 50mg/kg with a sulphur content of 53 mg/kg.

*Statistical significance:* The minimum tolerance limits for statistical significance for the RON and MON test methods (94.6 and 84.5) were not exceeded for these samples, and they were therefore compliant with the Directive. The tolerance limit of 20.7%v/v was not exceeded for olefins and the tolerance limit of 37.2% v/v was not exceeded for aromatics. The sulphur tolerance limit is 54 mg/kg and the sample was therefore compliant with the directive.

*Member State Notes* The sample in which summer vapour pressure exceeded limiting values was collected from a service station in May 2007, which is outside the UK summer period, but within the period when petrol distributed in the UK should have met the summer vapour pressure. It reflects the transition from winter to summer vapour pressure.

***Petrol RON 98***

*Detail:* One or more samples of summer vapour pressure exceeded the limit value of 70 kPa with a maximum of 71.1 kPa – however no details have been provided as to whether this exceedance occurred in summer or winter. Samples of distillation at 100°C were below the limit value of 46%v/v with a minimum of 44.0 %v/v.

Olefins samples exceeded the maximum limit value of 18%v/v with 20.8%v/v and Aromatics exceeded the limiting value of a maximum of 35 %(v/v) with a sample of 36.2 % (v/v).

Sulphur content limit value of 50 mg/kg was exceeded by at least one sample with a maximum value of 53mg/kg.

*Statistical significance:* The maximum tolerance limit for statistical significance for the DVPE test method (71.9 kPa) was not exceeded and therefore samples were compliant with the Directive. The tolerance limit for distillation at 100°C (43.6%v/v), sulphur content tolerance limit (54 mg/kg) and aromatics tolerance limit (37.2% v/v) were not exceeded therefore samples were compliant with the Directive.

The maximum tolerance limit for Olefins is 20.7 % (v/v) and therefore one sample at 20.8 % (v/v) was non-compliant with the Directive.

*Member States Notes* The sample which exceeded the limiting value for summer vapour pressure was collected from a service station in August 2007. The Olefin sample result reported was just outside the 0.59R allowed under the Directive for a single test.

***Diesel***

*Detail:* The Cetane number minimum limit value of 51.0 was exceeded by at least one sample with a value of 50.6 and the Distillation -- 95-%-Point maximum limiting value of 360$^{o}$C was exceeded by at least one sample with a value of 363.5 $^{o}$C.

*Statistical significance:* The tolerance limit value for statistical significance for the cetane test method (48.5) was not exceeded and the tolerance limit for Distillation -- 95-%-Point (365.9 $^{o}$C) were not exceeded – therefore samples were compliant with the Directive.

## 29.3 Temporal trends

Figure 29.2 to Figure 29.4 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales. Between 2001 and 2007, total petrol sales fell by 15% and diesel sales have risen by 29%. 2007 reporting shows that the UK has moved to 100% low sulphur fuels since 2006 and 2007 shows, for the first time, availability of sulphur free diesel, which represents 60.3% of total diesel fuel sales.

**Figure 29.2: Temporal trends in national sales of petrol and diesel (million litres)**


**Figure 29.3: Temporal trends in national sales of low sulphur petrol (%)**

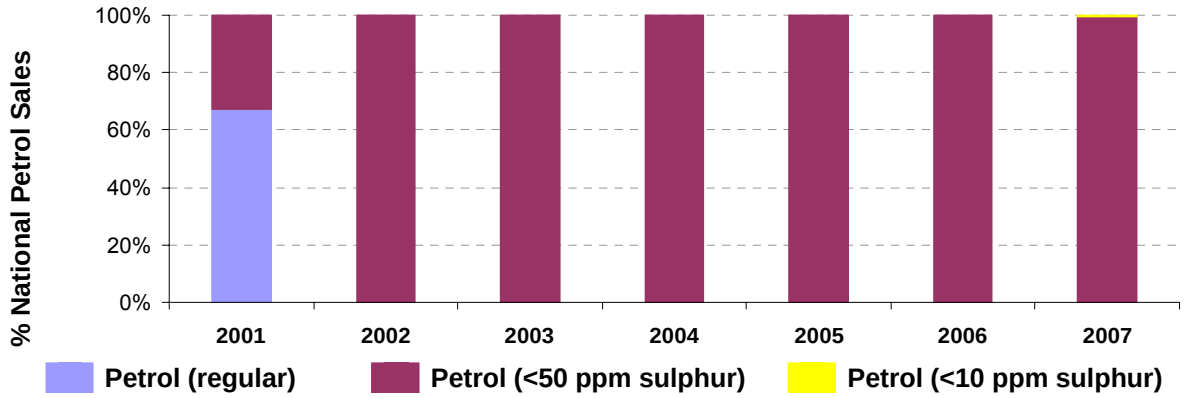



**Figure 29.4: Temporal trends in national sales of low sulphur diesel (%)**

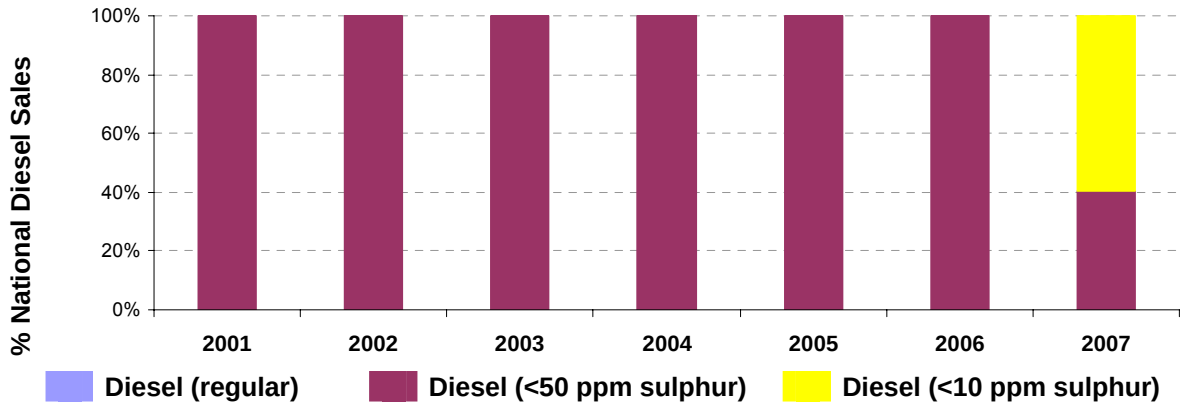
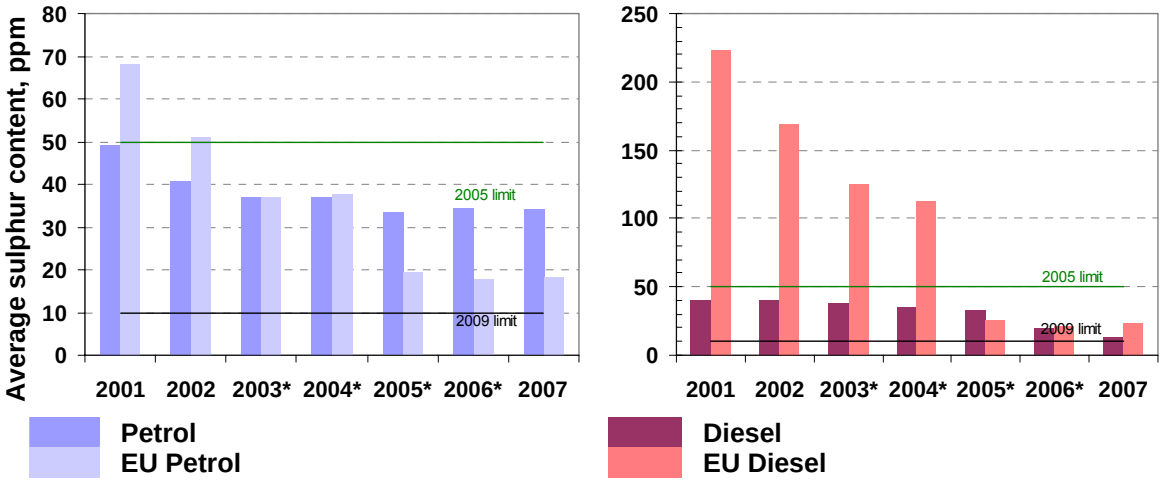



Figure 29.5 shows the trend in the average sulphur content of petrol and diesel fuels compared with the EU average (derived from sample analysis results and relative sales). Although the UK was one of the first Member States to switch completely to low sulphur

(<50ppm) fuels, there has been relatively slow improvement in sulphur content since 2001. The average sulphur content of both petrol and diesel fuels has decreased since 2001 with levels remaining at a similar level since 2003 for petrol and 2001 for diesel, as a result the UK average sulphur content of petrol fuel was above the EU average, and diesel fuel below the EU average.

**Figure 29.5: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* EU average excludes France, who did not report in 2003-5 and Malta, who did not report in 2006 and includes new EU10 Member States from 2004.

## 29.4 Key Areas for Improvement

The following table summarises the main areas in which improvements could be made to the monitoring system, reporting or compliance with Directive limit values.

| Key Areas for Improvement |
|---|
| • The UK was 8 months late in submitting its 2007 report.<br>• No information has been provided on whether the National Fuel Quality Analysis Model adopted by the UK is comparable to EN 14274, stating simply that the UK sampling programme is more extensive than required under EN 14274 as shown by the number of samples taken.<br>• In contrast to 2006, sulphur free fuels are now available for diesel. However, sampling analysis has been combined with that of low sulphur diesel grades. Sampling analysis could have been reported for sulphur free diesel separately as it comprises 59.7% of total diesel sales in the UK.<br>• The UK has not provided the numbers of samples taken for analysis from refuelling stations.<br>• The FQMS should be run twice a year, once during the winter period and once during the summer period. The UK has provided amalgamated full year results, only and not reported separately for each FQMS testing run.<br>• No information has been given about the geographic availability of sulphur free diesel. |

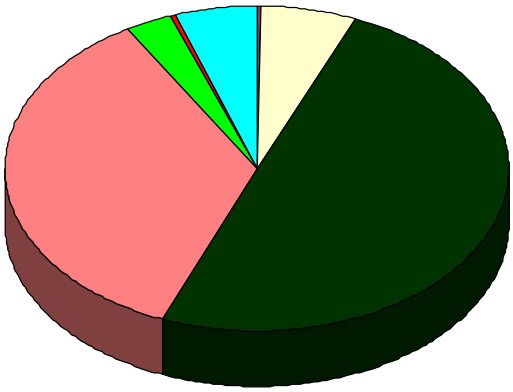
# 30 EU Summary

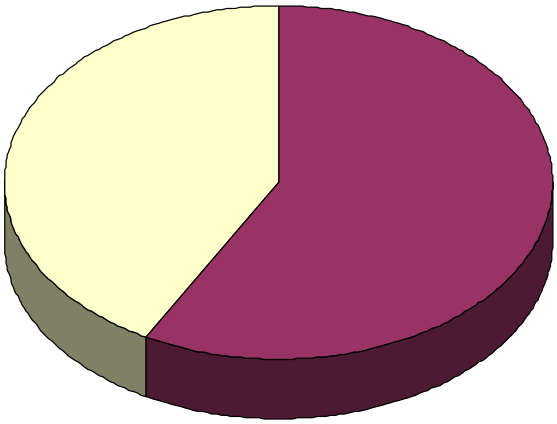
## 30.1 Fuel Availability 2007

### 30.1.1 Sales

**Figure 30.1: EU Fuel sales proportions by fuel type (%)**

| Petrol Sales | 2007 | Diesel Sales | 2007 |
|---|---|---|---|





| | Fuel Type | % | | Fuel Type | % |
|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | 0.0% | 13 | Diesel | 0.0% |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | 0.2% | 14 | Diesel (<50 ppm sulphur) | 57.9% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 6.3% | 15 | Diesel (<10 ppm sulphur) | 42.1% |
| 4 | Unleaded petrol min. RON=95 | 0.0% | | | |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 49.7% | | | |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 35.2% | | | |
| 7 | Unleaded petrol 95=<RON<98 | 0.0% | | | |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | 3.0% | | | |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | 0.07% | | | |
| 10 | Unleaded petrol RON>=98 | 0.0% | | | |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 0.1% | | | |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 5.3% | | | |

Figure 30.1 (see also Table 30.1) shows the 2007 data for the EU, excluding Luxembourg who failed to submit a report. The variety of RON and sulphur grade fuels available across the EU decreased in 2005 with the new mandatory limit of <50ppm sulphur. The majority of sales in 2007 comprised RON 95 (85%, with 50% low sulphur and 35% sulphur free). Of all petrol sold, 53% was low sulphur (<50 ppm) and 47% sulphur free (<10 ppm). Of all diesel sold the equivalent split was 58% and 42%. Sales from the new EU12 Member States comprised 12.4% and 12.6% of total petrol and diesel sales in the EU respectively (down slightly since 2005). Higher proportions of sulphur-free petrol grades were sold in the EU10 (49%) compared to the EU15 (46%). Similarly, higher proportions of sulphur-free diesel, was sold in the EU10 (49%) compared to the EU15 (41%).

**Table 30.1: 2007 EU fuel sales by fuel type (million litres) (Excludes Luxembourg who did not submit a report).**

| ID No. | Million litres / Fuel grade | Austria AT | Belgium BE | Denmark DK | Finland FI | France FR | Germany DE | Greece EL | Ireland IE | Italy IT | Luxembourg LU | Netherlands NL | Portugal PT | Spain ES | Sweden SE | UK UK | EU15 EU15 | EU15 % Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | - | - | - | - | - | - | - | - | 0 | - | - | - | - | - | 0 | 0.0% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | 642 | - | 507 | - | - | 7,548 | - | - | - | - | - | - | - | - | - | 8,697 | 7.2% |
| 4 | Unleaded petrol min. RON=95 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | - | 71 | - | - | 10,145 | - | 4,744 | 1,680 | 13,816 | 0 | - | - | 7,917 | - | 22,890 | 61,264 | 50.6% |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | 1,944 | 1,358 | 1,917 | 2,272 | - | 20,458 | - | 792 | 1,423 | - | 5,418 | - | - | 4,914 | - | 40,498 | 33.4% |
| 7 | Unleaded petrol 95=<RON<98 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | - | - | - | - | - | 453 | - | - | - | - | 1,845 | 0 | - | 1,129 | 3,427 | 2.8% |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 92 | 92 | 0.1% |
| 10 | Unleaded petrol RON>=98 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | - | 23 | - | - | - | - | - | - | - | 0 | - | - | - | - | - | 23 | 0.0% |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | 76 | 435 | 11 | 209 | 3,210 | 824 | 401 | - | - | - | 166 | 305 | 1,137 | 322 | - | 7,096 | 5.9% |
| | **Petrol (regular)** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0.0%** |
| | **Petrol (<50 ppm sulphur)** | **0** | **94** | **0** | **0** | **10,145** | **0** | **5,197** | **1,680** | **13,816** | **0** | **0** | **1,845** | **7,917** | **0** | **24,019** | **64,714** | **53.4%** |
| | **Petrol (<10 ppm sulphur)** | **2,662** | **1,793** | **2,435** | **2,481** | **3,210** | **28,829** | **401** | **792** | **1,423** | **0** | **5,585** | **305** | **1,137** | **5,236** | **92** | **56,383** | **46.6%** |
| | **Total Petrol** | **2,662** | **1,888** | **2,435** | **2,481** | **13,354** | **28,829** | **5,598** | **2,472** | **15,239** | **0** | **5,585** | **2,150** | **9,054** | **5,236** | **24,111** | **121,097** | **100.0%** |
| 13 | **Diesel** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% |
| 14 | **Diesel (<50 ppm sulphur)** | 1,132 | 387 | - | - | 38,461 | - | 4,131 | 2,558 | 31,573 | 0 | - | 5,491 | 30,773 | - | 10,285 | 124,790 | 58.9% |
| 15 | **Diesel (<10 ppm sulphur)** | 6,338 | 7,361 | 3,191 | 2,607 | 1,061 | 35,524 | 36 | 645 | 1,982 | - | 7,979 | 317 | 0 | 4,679 | 15,216 | 86,936 | 41.1% |
| | **Total Diesel** | **7,469** | **7,748** | **3,191** | **2,607** | **39,521** | **35,524** | **4,167** | **3,203** | **33,555** | **0** | **7,979** | **5,808** | **30,773** | **4,679** | **25,501** | **211,726** | **100.0%** |

| ID No. | Million litres / Fuel grade | Cyprus CY | Czech Republic CZ | Estonia EE | Hungary HU | Latvia LV | Lithuania LT | Malta MT | Poland PL | Slovakia SK | Slovenia SI | Bulgaria BG | Romania RO | EU12 EU12 | EU12 % Total | European Union EU | European Union % Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Unleaded petrol min. RON=91 | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 0 | 0.0% |
| 2 | Unleaded petrol min. RON=91 (<50 ppm S) | - | 161 | - | - | 12 | 80 | - | - | 19 | - | - | - | 272 | 1.6% | 272 | 0.2% |
| 3 | Unleaded petrol min. RON=91 (<10 ppm S) | - | 0 | - | - | - | - | - | - | 23 | - | - | - | 23 | 0.1% | 8,720 | 6.3% |
| 4 | Unleaded petrol min. RON=95 | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 0 | 0.0% |
| 5 | Unleaded petrol min. RON=95 (<50 ppm S) | 427 | 2,732 | - | - | 453 | 695 | 77 | 93 | 105 | - | 822 | 2,070 | 7,473 | 43.7% | 68,737 | 49.7% |
| 6 | Unleaded petrol min. RON=95 (<10 ppm S) | - | 0 | 404 | 1,970 | - | 7 | - | 4,964 | 646 | - | - | 227 | 8,217 | 48.0% | 48,715 | 35.2% |
| 7 | Unleaded petrol 95=<RON<98 | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 0 | 0.0% |
| 8 | Unleaded petrol 95=<RON<98 (<50 ppm S) | - | - | - | - | - | - | 18 | - | - | 741 | - | - | 759 | 4.4% | 4,186 | 3.0% |
| 9 | Unleaded petrol 95=<RON<98 (<10 ppm S) | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 92 | 0.1% |
| 10 | Unleaded petrol RON>=98 | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 0 | 0.0% |
| 11 | Unleaded petrol RON>=98 (<50 ppm S) | 48 | - | - | - | 3 | - | - | 30 | 1 | 80 | - | - | 162 | 0.9% | 185 | 0.1% |
| 12 | Unleaded petrol RON>=98 (<10 ppm S) | - | 40 | 56 | 74 | - | 18 | - | 0 | 16 | - | - | - | 203 | 1.2% | 7,299 | 5.3% |
| | **Petrol (regular)** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0.0%** | **0** | **0.0%** |
| | **Petrol (<50 ppm sulphur)** | **475** | **2,893** | **0** | **0** | **468** | **775** | **95** | **123** | **126** | **821** | **822** | **2,070** | **8,666** | **50.7%** | **73,380** | **53.1%** |
| | **Petrol (<10 ppm sulphur)** | **0** | **40** | **459** | **2,044** | **0** | **25** | **0** | **4,964** | **685** | **0** | **0** | **227** | **8,443** | **49.3%** | **64,826** | **46.9%** |
| | **Total Petrol** | **475** | **2,933** | **459** | **2,044** | **468** | **799** | **95** | **5,087** | **811** | **821** | **822** | **2,297** | **17,109** | **100.0%** | **138,205** | **100.0%** |
| 13 | **Diesel** | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 0.0% | 0 | 0.0% |
| 14 | **Diesel (<50 ppm sulphur)** | 418 | 4,769 | 201 | - | 896 | 1,136 | 110 | 339 | 323 | 1,366 | 2,228 | 3,849 | 15,635 | 51.1% | 140,424 | 57.9% |
| 15 | **Diesel (<10 ppm sulphur)** | - | 0 | 246 | 2,408 | 37 | 137 | - | 10,976 | 631 | - | - | 555 | 14,991 | 48.9% | 101,927 | 42.1% |
| | **Total Diesel** | **418** | **4,769** | **447** | **2,408** | **933** | **1,273** | **110** | **11,316** | **954** | **1,366** | **2,228** | **4,404** | **30,625** | **100.0%** | **242,351** | **100.0%** |

**Figure 30.2: National fuel sales by fuel type across the EU (million litres)***

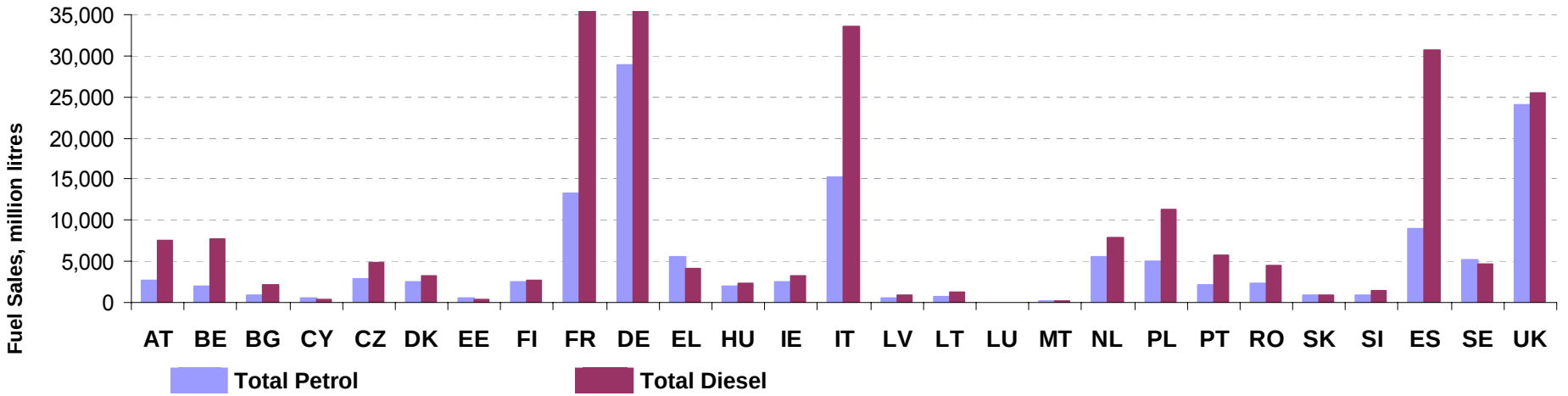
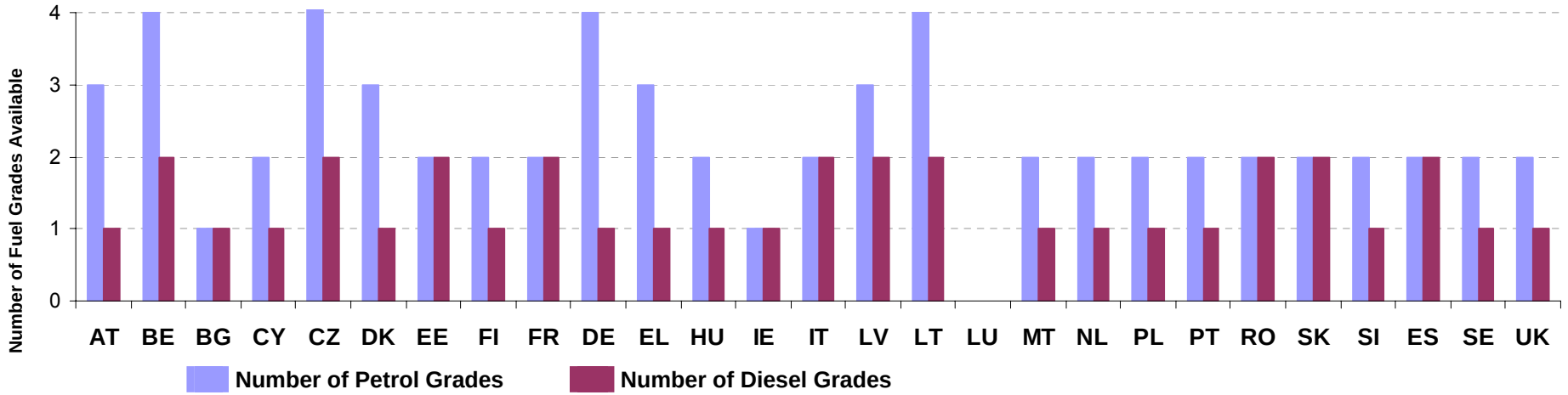



**Figure 30.3: Number of fuel grades available nationally by fuel type across the EU**



Similarly to 2001 - 2006, the largest total sales of fuels (of submissions received) in 2007 were made in France, Germany, Italy, Spain and the United Kingdom (Figure 30.2). Diesel sales are dominant in almost all Member States, however the relative sales of petrol and diesel vary significantly.

Since 2001 there has been increased homogeneity in the number of grades of fuel reported to be available across the EU (Figure 30.3), in 2007 there are generally 2-3 petrol grades available, mainly a result of different octane levels (RON category), however separate sulphur-free grades are appearing in some cases. Five of the EU Member States have only Sulphur (<10ppm) free petrol and diesel available nationally.

### 30.1.2 Sulphur content

Already in 2001 - 2005 low sulphur fuels were available in many countries across the EU, even though mandatory introduction was not required until 2005 (see Figure 30.4 and Figure 30.5). Low sulphur (<50 ppm) grades were mandatory from 1 January 2005, as was the introduction of sulphur-free (<10 ppm) fuels, however a significant number of Member States are yet to introduce separately marketed (and labelled) sulphur free fuels, a few have not provided sufficient information to judge whether they are available *"on an appropriately balanced geographical basis"*, as required by the Directive.

Member States do not have to fully switch to sulphur-free fuels until 2009. However, in the EU15, six Member States (Austria, Denmark, Finland, Germany, Netherlands and Sweden) had already fully moved over to sulphur free petrol grades and similarly for sulphur-free diesel grades in 2007. In Germany sulphur-free diesel has been available since 2003 and in Sweden virtually all diesel has been sulphur-free since 1999. Two of the new Member States had also fully switched to sulphur-free fuel grades – Estonia for petrol only and Hungary for both petrol and diesel. In addition, in Slovakia, Denmark and Belgium where low sulphur fuel grades (< 50 ppm) are marketed, the average sulphur content of some or all of these grades was found to be below 10 ppm. Thus in these countries it appears that fuel sales may be sulphur free.

As already mentioned, separate (or labelled) sulphur-free fuel grades, or separate sales figures were not available in 2007 in some Member States. Figure 30.6 presents the average sulphur content of petrol and diesel grades by Member State across the EU. (Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold).
Table 30.2 demonstrates that the annual average sulphur content of petrol and diesel fuels sold in the EU has decreased steadily from 2001 to 2005 in line with the requirements of the Directive. From 2006 to 2007, petrol sulphur content has levelled out at 18 mg/kg. 2007 diesel sulphur content has increased slightly within EU12 member states; however the overall EU diesel sulphur content has remained constant.

**Table 30.2: Annual trend in average sulphur content in petrol and diesel fuels**

| EU | Average Sulphur Content, ppm | | | | | | | EU15 | EU12 |
|---|---|---|---|---|---|---|---|---|---|
| **Fuel/Year** | **2001** | **2002** | **2003*** | **2004*** | **2005*** | **2006**** | **2007***** | **2007***** | **2007** |
| ***Petrol*** | 68 | 51 | 37 | 38 | 19 | 18 | 18 | 18 | 18 |
| ***Diesel*** | 223 | 169 | 125 | 113 | 25 | 22 | 23 | 23 | 24 |

* Excludes France, who did not report in 2003 - 2005. New EU10 joined from 2004.
** Excludes Malta, who did not report in 2006.
*** Excludes Luxembourg, who did not report in 2007.

**Figure 30.4: National sales of low sulphur petrol grades across the EU (%)**

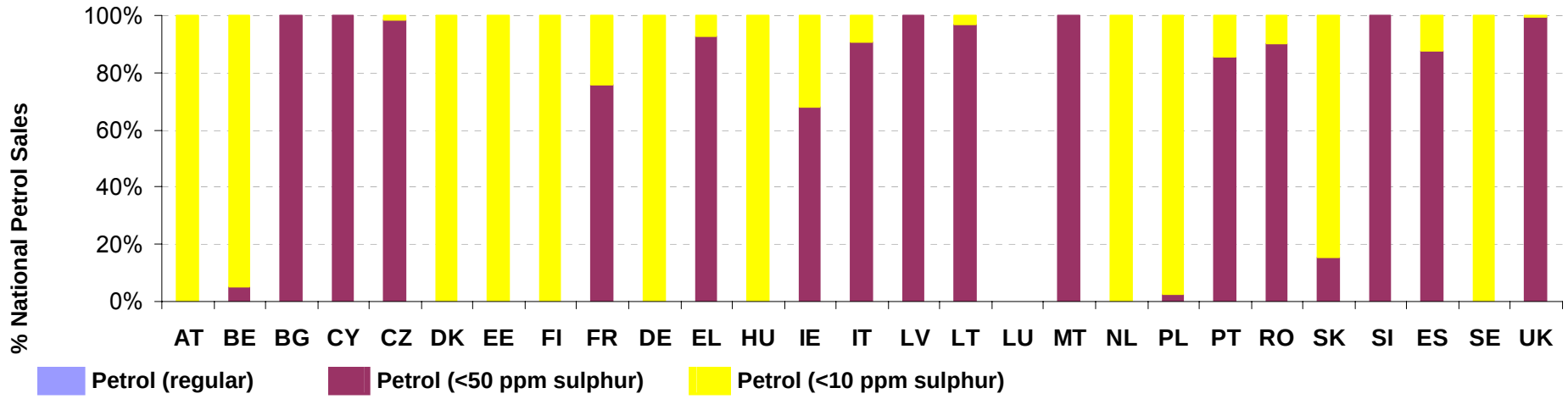



**Figure 30.5: National sales of low sulphur diesel grades across the EU (%)**

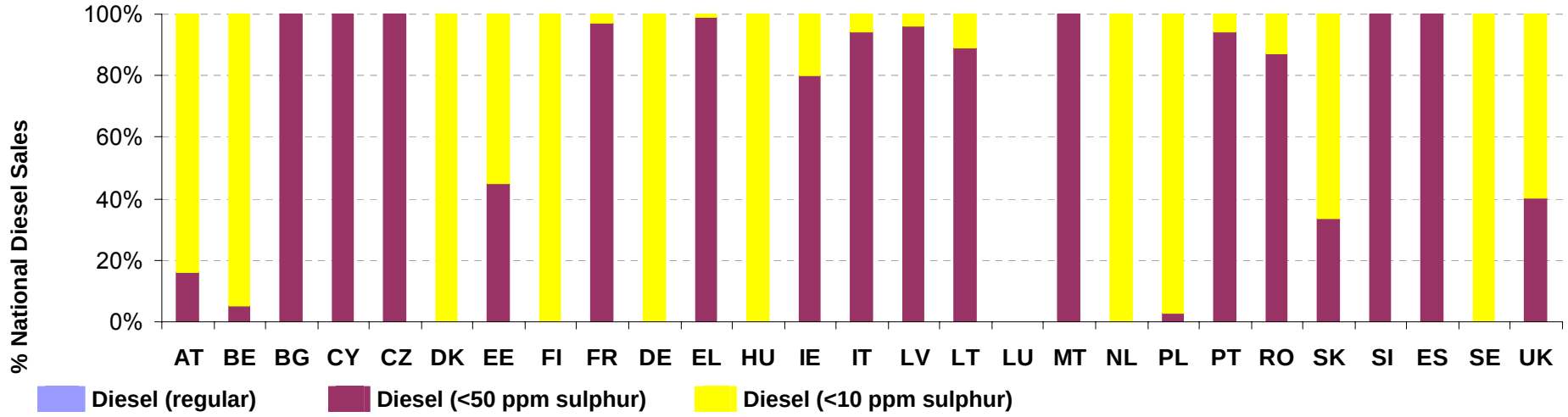
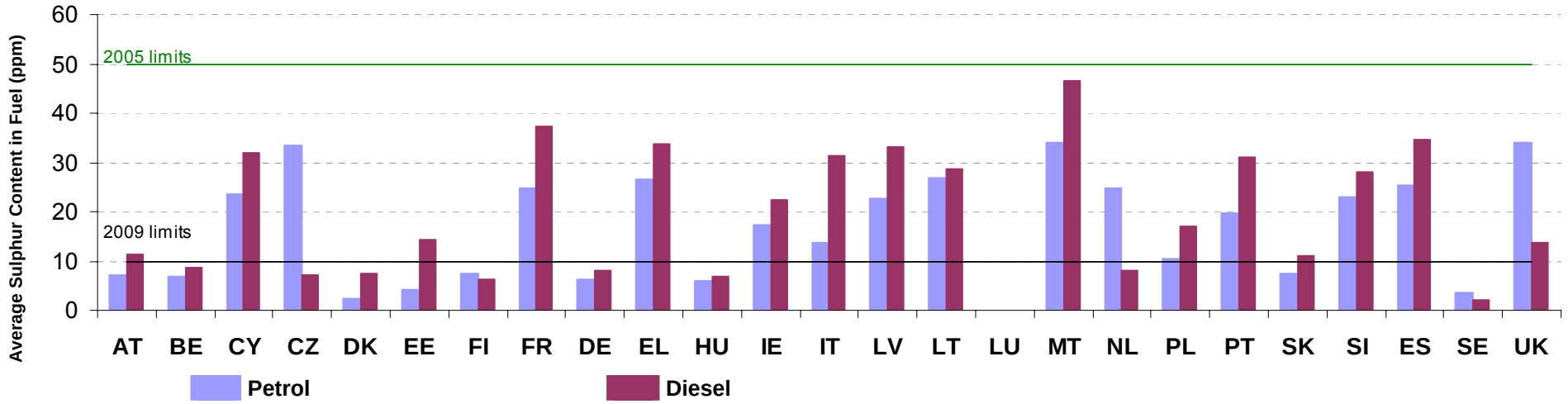


**Figure 30.6: Average sulphur content of petrol and diesel grades across the EU (%)**




*Notes*:
Excludes Luxembourg, who did not report in 2007

# 30.2 Fuel Quality Monitoring 2007

## 30.2.1 Description of systems

A number of different approaches have been used to implement Fuel Quality Monitoring Systems (FQMS) across the EU. These range from those based on European Standard EN 14274[17] with sampling at a range of fuel retail stations through to national systems. For example, systems in Sweden and the UK integrate sampling and analysis of all refinery or imported batches into the requirements for distribution of fuels within the country. There is also random sampling across the distribution chain throughout the year. The systems active in several Member States were originally designed for other purposes, which explain some of the variations in coverage and application across the EU.

A greater degree of homogeneity was expected from 2004, when Member States are required to report in accordance with EN 14274. According to the amended Directive: *"Member States shall establish a fuel quality monitoring system in accordance with the requirements of the relevant European Standard"* (EN 14274 and EN 14275[18]) from 1 January 2004. (A discussion of the changes resulting from these new standards was provided in section 1.2.3). Since 2001 a significant number of changes have been made to Monitoring Systems. Austria, Finland, France, Ireland, Italy, Greece and the Netherlands have now moved their systems to ones based upon EN 14274 (as have 9 of the new EU10+2 Member States). Portugal stated they are still in the process of changing its system to comply fully with EN 14274 (however they have also stated this in 2004 - 2006 reporting).

Of those reporting for 2007, 10 Member States in total are still using National Systems. Alternative monitoring systems may be permitted by the Directive, provided such systems ensure the results are of an equivalent confidence, although the criteria for assessing this are not specified. It is therefore not clear whether the existing systems not based on EN 14274 meet this criterion.

## 30.2.2 Sampling and reporting

There was still a wide range of sampling intensities across the EU in 2007 (Figure 30.7), as for previous years. There are requirements in EN 14274 on the numbers and locations of samples taken in their FQMS. EN 14274 lists a number of useful factors to take into account in 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 minimum number of samples per fuel grade (in each of the winter and summer periods), as discussed in the introductory section 2.2.2.

Figure 30.7 and Table 30.3 show that many Member States appear to satisfy the specifications for sampling numbers. However, it should be noted that the standard specifies individual samples taken at separate refuelling stations. In many reports from Member States using National Systems, sampling from separate refuelling sites is not always specified and in some cases sampling also takes place at other points of the distribution chain. For example, the systems of Sweden only take samples from refineries and/or terminals, which is clearly not sufficient to achieve the confidence required by the European Standard, as there is no method of assurance that the fuel is not contaminated/tampered

[17] EN 14274:2003 - Automotive fuels - Assessment of petrol and diesel quality - Fuel Quality Monitoring System (FQMS).
[18] EN 14275:2003 - Automotive fuels - Assessment of petrol and diesel fuel quality -Sampling from retail site station pumps and commercial site fuel dispensers.

with between the refineries/depots and the retail outlets. In contrast, Finland, Ireland, Portugal, Spain, Latvia and the UK take samples from across the entire distribution chain. In such cases reports do not always provide information on the number/proportion of samples that were for refuelling stations.

However, where EN 14274 is used, in terms of selecting the suitable statistical model as discussed in the introductory section 2.2.2, there remain issues to resolve. Several small-sized Member States are still indicating that they are using Model C in 2007, despite having clearly defined separate regions according to the NUTS classification system[19] at Level 2 (800,000 – 3 million people). These include Austria (10 NUTS Level 2 regions), Czech Republic (8 NUTS Level 2 regions), Hungary (7 NUTS Level 2 regions), Ireland (3 NUTS Level 2 regions), Romania (8 NUTS Level 2 regions) and Slovakia (4 NUTS Level 2 regions). In some of these countries it is clear that there is also more than one source/supply point for petrol and diesel fuels, suggesting that Model C may not be appropriate and that possibly either Model A or B should be used instead (e.g. Model A may be more appropriate for Austria). Where Model C is used, Member States should in future present a clear rationale for its use on the basis of both number of fuel sources/supply points and size/possibility of division of the territory into regions.

Assessing other countries utilising their own National Systems is difficult without additional information from the Member States on the statistical confidence of their system and details on the fuel supply situation in their country. However, it seems likely that in certain countries the national system does not match the same level of confidence as EN 14274. Portugal appears to have insufficient samples to achieve the same confidence, and Sweden's system does not involve sampling at refuelling stations at all, so is clearly not able to establish confidence that the quality of the fuel at the pump is the same as at the refinery/terminal. Since 2005 Greece has also only sampled at the refinery, although it has been stated this is a temporary measure.

In general, however, significant progress seems to have been made again by all countries in improving monitoring system methodologies, increasing the number of samples taken and analysed and in the reporting aspects. Figure 30.7 illustrates this, showing improvements in sampling rate in 2007 of EU15 countries in contrast to the 2001 sampling in Figure 30.8 – notably in Greece, France, Ireland and the Netherlands. However, diesel sampling by Portugal has *decreased* by around 30%. Sampling numbers are also up significantly in the new EU10 +2.

[19] The Nomenclature of Territorial Units for Statistics (NUTS) is a three-level hierarchical classification, established by Eurostat more than 25 years ago in order to provide a single uniform breakdown of territorial units for the production of regional statistics for the EU. Additional information on NUTS may be found on the Eurostat web site at: http://europa.eu.int/comm/eurostat/ramon/nuts/home_regions_en.html

**Table 30.3: Summary of Member State sampling and reporting in relation to the requirements of Directive 98/70/EC and of European Standard EN 14274**

| | FQMS Model | Country Size | Separate Summer & Winter reporting | | Sampling Location | EN 14274 Samples per grade per period [4] | Calc. EN 14274 Sample Total Req. [5] | | Samples Taken | | Compliance with EN 14274 Sampling Numbers | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | Petrol | Diesel | (3) | | Petrol | Diesel | Petrol | Diesel | Petrol | Diesel | |
| **AT** | C | Small | Yes | Yes | S | 50 | 203 | 100 | 203 | 100 | Yes | Yes | |
| **BE** | N | Small | Yes | Yes | S | - | - | - | 4795 | 5604 | - | - | (a) |
| **BG** | N | Small | Yes | Yes | S | - | - | - | 34 | 38 | - | - | |
| **CY** | C | Small | Yes | Yes | S, T | 50 | 150 | 75 | 346 | 264 | Yes | Yes | |
| **CZ** | C | Small | Yes | Yes | S | 50 | 81 | 75 | 1008 | 545 | Yes | Yes | |
| **DK** | N | Small | Yes | Yes | S | - | - | - | 41 | 21 | - | - | |
| **EE** | C | Small | Yes | Yes | S | 50 | 150 | 150 | 350 | 208 | Yes | Yes | |
| **FI** | A | Small | Yes | Yes | S (T, R) | 50 | 109 | 100 | 258 | 184 | Yes | Yes | (b) (c) |
| **FR** | B | Large | Yes | Yes | S | 200 | 800 | 411 | 744 | 529 | No | Yes | |
| **DE** | N | Large | No | No | S | - | - | - | 431 | 265 | - | - | (d) |
| **EL** | A | Small | Yes | Yes | R | 50 | 117 | 100 | 289 | 120 | Yes | Yes | (e) (e) |
| **HU** | C | Small | Yes | Yes | S | 50 | 78 | 75 | 121 | 121 | Yes | Yes | |
| **IE** | C | Small | Yes | Yes | S, T, R | 50 | 100 | 100 | 116 | 95 | Yes | No | |
| **IT** | A | Large | Yes | Yes | S | 100 | 219 | 212 | 299 | 382 | Yes | Yes | |
| **LV** | N | Small | Yes | Yes | S, T, R | - | - | - | 705 | 888 | - | - | (d) |
| **LT** | C | Small | Yes | No | S, T | 50 | 86 | 150 | 147 | 100 | Yes | No | |
| **LU** | | | | | | | | | | | | | (f) |
| **MT** | N | Small | Yes | Yes | S, T | - | - | - | 28 | 17 | - | - | (d) |
| **NL** | A | Small | Yes | Yes | S | 50 | 103 | 100 | 100 | 100 | No | Yes | (d) (g) |
| **PL** | B | Small | Yes | Yes | S | 100 | 155 | 155 | 551 | 322 | Yes | Yes | |
| **PT** | N | Small | Yes | Yes | S, T, R | - | - | - | 107 | 66 | - | - | (h) |
| **RO** | C | Small | Yes | Yes | S | 50 | 110 | 200 | 101 | 105 | No | No | |
| **SK** | C | Small | Yes | Yes | S | 50 | 79 | 75 | 174 | 217 | Yes | Yes | (i) |
| **SI** | C | Small | Yes | Yes | S | 50 | 83 | 75 | 139 | 154 | Yes | Yes | |
| **ES** | N | Large | Yes | Yes | S, T, R | - | - | - | 485 | 358 | - | - | (d) |
| **SE** | N | Small | Yes | No | T, R | - | - | - | 899 | 675 | - | - | (d) |
| **UK** | N | Large | No | No | S, T, R | - | - | - | 2046 | 2171 | - | - | |

**Notes:**

(1) N = National Fuel Quality Monitoring System (FQMS);
A, B or C = FQMS based on EN 14274 Statistical model A, B or C

(2) Small countries are defined in EN 14274 as with <15 million tonnes automotive fuel dispensed per year.

(3) S = Refuelling Stations; T = Terminals / Depots; R = Refinery

(4) There are reduced sampling requirements for grades comprising of less than 10% total sales

(a) Oxygen content has not been reported for all four reporting petrol grades. Lead Content has not been reported for low sulphur petrol fuel grades

(b) octane (total 47 petrol samples) analysis were done from the samples taken from fuel refineries and terminals.

(c) cetane (68 diesel samples) analysis were done from the samples taken from fuel refineries and terminals

(d) No information was provided on whether the national monitoring system is equivalent in confidence with the requirements of EN 14274

(e) Greece has stated the FQMS has been designed but it has not been fully applied for 2007, however this has been the case for the last three years. This report concerns the results of the samples that are taken at refineries only.

(f) Luxembourg did not submit an FQMS report for 2007.

(g) No sample analyses were provided for oxygen content (however analyses were carried out for individual oxygenates)

(h) Portugal states the EN 14274 statistical model is being implemented. Meanwhile Portugal is using a National Methodology. However, this has also been stated in the previous two years reports.

(i) Production of Petrol 91 RON has been stopped in the winter season of 2006. During January and February 2007 was sold out Petrol 91 RON, which was stored in the terminals.

**Figure 30.7: Fuel Quality Monitoring sampling rate across the EU in 2007 (average number of samples per fuel grade)**

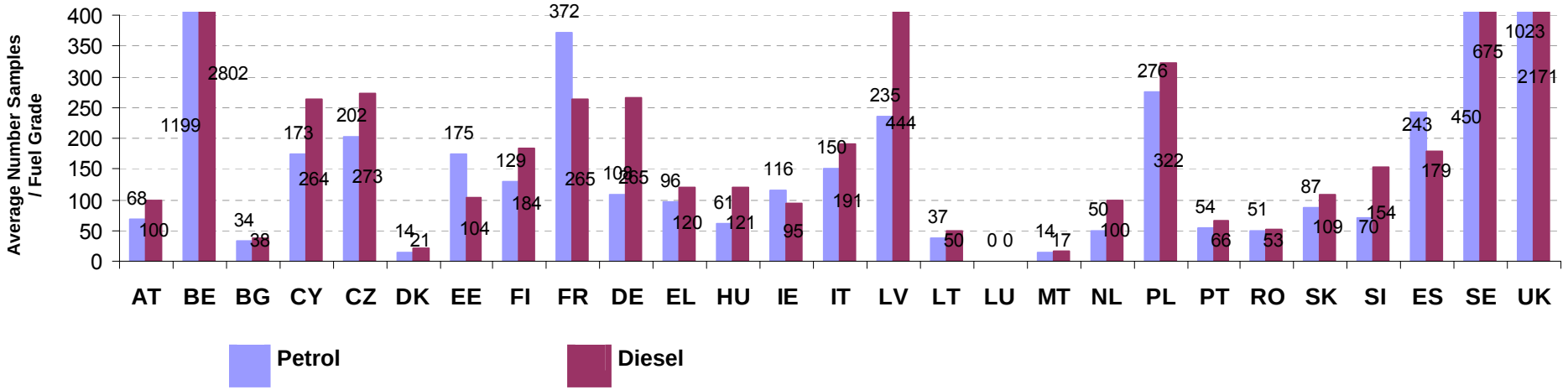
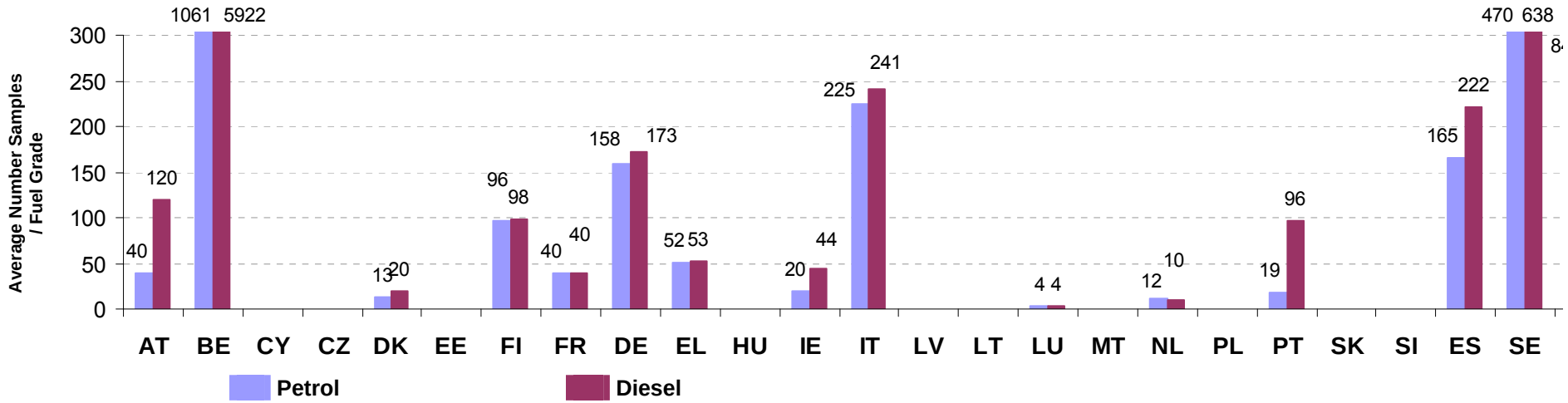



**Figure 30.8: Fuel Quality Monitoring sampling rate across the EU in 2001 (average number of samples per fuel grade)**



### 30.2.3 Compliance with 98/70/EC limit values

***Petrol reporting***

In 2007, 17 of the Member States (8 of the EU15) reported at least one petrol sample that was non-compliant with Directive 98/70/EC. This is compared to 10 in 2001 from EU15 Member States. Of these, the main parameters of concern were again research/motor octane number (RON/MON, 68 samples), summer vapour pressure (DVPE, 43 samples) and distillation - evaporation at 100/150°C (14 samples). Although many Member States reported non-compliant samples, far fewer samples exceeded the limit values (and the limits of tolerance for the test methods) compared to previous years. Several of the new EU10 Member States reported significant numbers of samples non-compliant with limit values in previous years, which was significantly reduced in 2006. However, the 2007 results show again increased number of samples non-compliant with limit values. The complete detailed reports on analysis submitted for each Member State are included in Appendix 3.

***Diesel reporting***

For diesel, 12 of the Member States (4 of the EU15) reported at least one sample that was non-compliant with Directive 98/70/EC. This is compared to 4 in 2001 from EU15 Member States and 10 EU MS in 2006 (3 of the EU15). Of these, the parameters of concern were sulphur content (28 samples), distillation 95% point (11 samples) and cetane number (2 samples). Since 2006 there is significant reduction in the number of samples exceeding the limit value (and the limits of tolerance for the test methods) compare to previous years. As for petrol several of the new EU10 Member States reported significant numbers of samples non-compliant with limit values in previous years, which have been significantly reduced for 2007. Sulphur content proved a particular problem for the previous year (mainly the new EU10), due to the new mandatory <50 ppm level from the start of 2005, which appears to have been resolved from 2006. The complete detailed reports on analysis submitted for each Member State are included in Appendix 3.

***Overall Summary***

Table 30.4 summarises the compliance of Member States with Directive 98/70/EC for the year 2007 reporting in terms of the results of the analysis of samples against limit values and the reporting format and content. As in 2001 - 2006 the quality of the compliance assessment suffers in a few cases from incomplete information provided by Member States. Details of action taken with regard to limit value non-compliance by Member States are included where provided in the individual country chapters of this report.

In terms of compliance with Directive 98/70/EC, of the 26 reports received (Luxembourg has not submitted a report), 6 Member States are in complete compliance with limit values for both petrol and diesel for all samples (compared to 5 in 2001 for the EU15 and 8 in 2006 for EU25). 19 Member States also provided complete reporting across the range of parameters specified for monitoring in the Directive. Detail on specific non-compliances is provided in the individual country chapters and a new summary of temporal trends in compliance is provided in section 30.3.3.

The recent amendments to Directive 98/70/EC (Directive 2003/17/EC) included the insertion of a paragraph which states *"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."* It is expected that the implementation of this requirement will have positive repercussions on compliance. Indeed the number of non-compliant samples has again in general decreased this year.

**Table 30.4: Summary of Member State compliance with 98/70/EC for 2007 reporting.**

| Member State | Limit value non-compliance[1] (95% confidence limits) (Non-compliant samples / Total samples) | | Incomplete reporting (Number of parameters not measured / Total) | | Late report (Due by 30/6/2008) (2) | Notes |
|---|---|---|---|---|---|---|
| | Petrol | Diesel | Petrol | Diesel | | |
| Austria | | >2 / 100 | | | <1 month | (3) |
| Belgium | >39 / 4795 | 39 / 5604 | 2 / 18 | 1 / 4 | <2 months | (4) (5) |
| Bulgaria | 8 / 34 | 2 / 38 | 5 / 18 | 2 / 5 | | (22) (23) |
| Cyprus | 2 / 346 | 2 / 264 | 1 / 17 | | <4 months | (12) (13) |
| Czech Republic | 43 / 1008 | 7 / 545 | | | | |
| Denmark | | | | | <1 month | |
| Estonia | 17 / 350 | | | | | (14) (15) |
| Finland | | 1 / 184 | | | | (6) |
| France | 44 / 744 | | | | | (6) |
| Germany | >5 / 431 | >4 / 265 | | | <3 months | |
| Greece | | | | | <1 month | (6) |
| Hungary | 2 / 121 | | | | | |
| Ireland | 5 / 116 | | | | <4 months | (7) |
| Italy | 9 / 299 | 5 / 382 | 5 / 13 | | <4 months | (8) (6) |
| Latvia | 2 / 705 | 1 / 888 | | | <1 month | (16) (17) |
| Lithuania | | | | | | |
| Luxembourg | | | | | | (26) |
| Malta | 3 / 28 | 3 / 17 | | | <12 months | (18) (19) |
| Netherlands | 5 / 100 | | 1 / 17 | | <4 months | (6) |
| Poland | 30 / 551 | 2 / 322 | | | | (20) |
| Portugal | | | 3 / 15 | | <1 month | |
| Romania | > 5 / 101 | > 15 / 105 | | | | (24) (25) |
| Slovakia | 17 / 174 | | | | | (21) |
| Slovenia | 5 / 139 | 2 / 154 | | | <1 month | |
| Spain | | | | | | |
| Sweden | | | 7 / 11 | | | (9) (10) |
| UK | > 1 / 2046 | | | | | (11) |
| **No. Countries** | **17** | **12** | **7** | **2** | **13** | |

***Notes:***

| | |
|---|---|
| (1) | It has not been possible to determine 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) | Directive 98/70/EC states that Member States should submit monitoring reports no later than 30th June each year. |
| (3) | One diesel sample has shown a sulphur content of 194 mg/kg which greatly exceeds <50 TLs. Austria has also reported some exceedences of the 10ppm sulphur content limit, however these values remain well within overall Directive sulphur content limit of 50ppm. |
| (4) | Oxygen content has not been reported for all four reporting petrol grades. MON, DVPE, Benzene, sulphur content were not reported for grade 11; MON, summer vapour pressure and sulphur content were not provided for grade 12 |
| (5) | Values for Cetane Index using test method EN ISO 4264 have been reported. |
| (6) | Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value |
| (7) | Sulphur non-compliance of 59.1 exceeds tolerance limit |
| (8) | Sulphur non-compliance with <10ppm limit value, but within <50ppm limit value and no sample analysis of oxygenates (except ethers). |
| (9) | For RON95 petrol: Oxygen content and six of the seven oxygenates have not been reported. For RON98 petrol: Six of the seven oxygenates (ie other than ethers with more than 5 carbon atoms per molecule) have not been reported. Member State comments: "Ethanol is added at the gantry but also at refineries. Therefore the DVPE is a mix of both with and without ethanol. The addition of |

| | |
|---|---|
| | Ethanol of up to 5% increases the DVPE with about 7 kPa. The oxygen content is not available in the finished fuel" |
| (10) | No sampling details for summer and winter period available for Diesel. |
| (11) | At least one sample exceeds the tolerance Limit for Olefins |
| (12) | The iso-butyl concentration cannot be determined with the existing apparatus and so this parameter has not been tested |
| (13) | Two samples gave values of 123.5 mg/kg and 122.8 mg/kg - the non-compliance resulted in Penal Prosecution |
| (14) | DVPE summer sample non-compliance numbers RON 98 grade fuel not reported. 3 Sulphur samples exceeded tolerance limits for <10ppm sulphur content fuel grade, however all within limits as set by the Directive - Estonia is investigating the cause. |
| (15) | Separate Summer and winter sample analysis results given for both grades of Diesel (no FY results) and no breakdown of temporal spread of sampling for grades by season. 15 Sulphur samples exceeded tolerance limits for <10ppm sulphur content diesel grade, however all within limits as set by the Directive - Estonia is investigating the cause. |
| (16) | No detail has been provided on the number of non-compliant road fuel diesel samples and the values with which they are non-compliant. |
| (17) | No detail has been provided on the number of non-compliant road fuel petrol samples and the values with which they are non-compliant. |
| (18) | All non-compliance for RON found on the market – not within shipped in fuels (indicates contamination post distribution) |
| (19) | Cetane index (ASTM D976) is reported instead of cetane number. Density at 15oC tested using ASTM D4052. Sulphur content tested using ASTM D2622. |
| (20) | Poland took action on fuel sample non-compliances; by sending a notice to the Public Prosecutor's Office and the President of Energy Regulatory Office, sending a notice to the police or the Regional inspectorate Inspectorate of Commerce did not take action because of ongoing Inspectorate Inspectorate of Commerce administrative proceedings. |
| (21) | Production of Petrol 91 RON has been stopped in the winter season of 2006. During January and February 2007 was sold out Petrol 91 RON, which was stored in the terminals. |
| (22) | On the basis of the established non-compliances 7 penalties acts were issued with total fines amounting to 75 000 Euro. |
| (23) | Parameters not analysed included: Polycyclic aromatic hydrocarbons and cetane number. Instead of cetane number, the cetane index was evaluated and reported on |
| (24) | No details given on the number of samples that exceeded tolerance limits, or the values by which samples exceeded tolerance limits. |
| (25) | NACP fined all stations that did not respect environmental specifications. 12 Sulphur exceedances have been reported, however no details on other non-compliant parameters. |
| (26) | Luxembourg has not reported on Fuel Quality Monitoring for reporting year 2007 |

# 30.3 Temporal trends

### 30.3.1 Sampling and reporting

The following figures provide a summary of the temporal trends in the sampling and reporting in the European Union. It can be seen in Figure 30.9 that whilst the numbers of Member States reporting on time has in general improved, a handful of Member States are still delivering very late, preventing timely completion of this summary report. This has been particularly problematic this year with several member states delivering reports less than 4 months late and the last full report received (from Malta) only in July 2009. Figure 30.10 shows that the number of Member States submitting in the Excel reporting template has steadily improved, providing a greater level of consistency and enhancing both speed and accuracy in the evaluation of submissions. Figure 30.11 shows that the level of sampling and analysis is also improving.

**Figure 30.9: Temporal trends in the punctuality of report submissions**

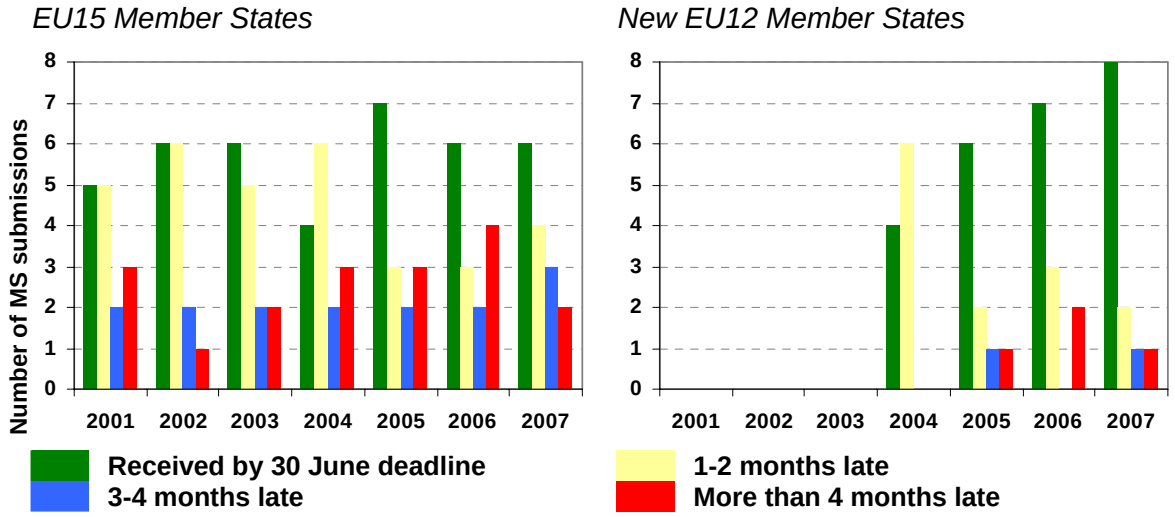



**Figure 30.10: Temporal trends in the format of Member State submissions**

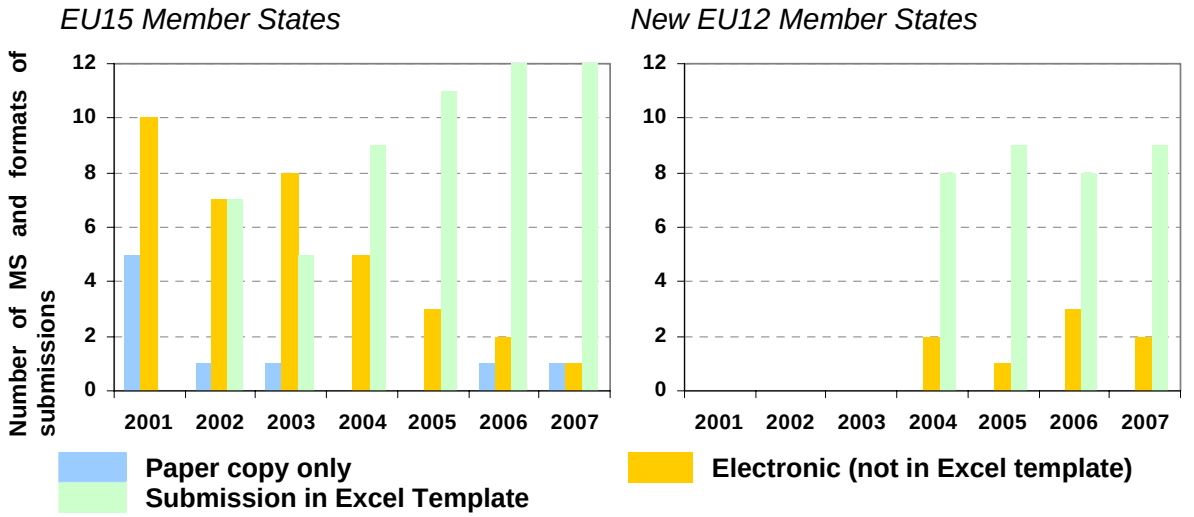
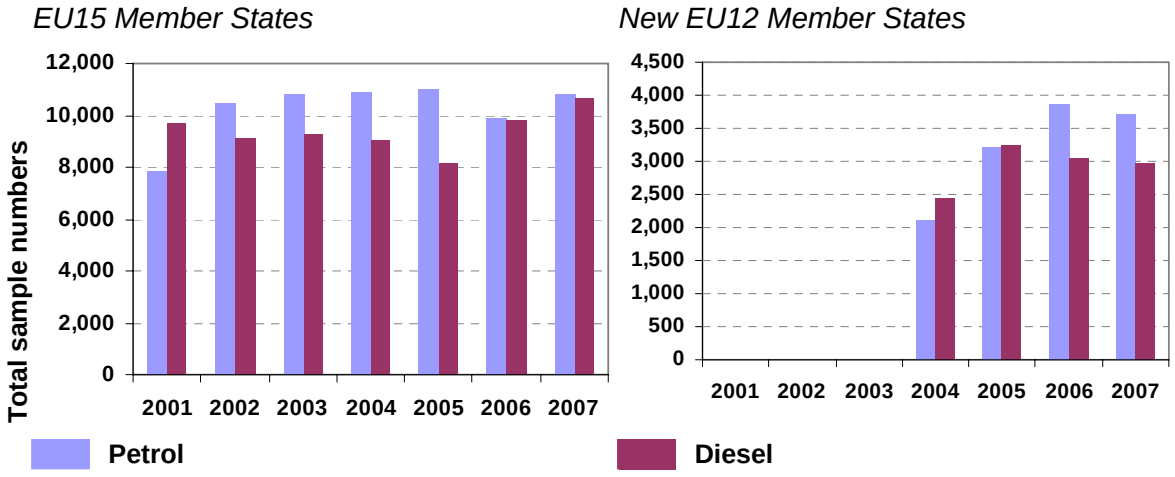



**Figure 30.11: Temporal trends in the total number of petrol and diesel samples taken**




* EU15 excludes France after 2002, which did not report in 2003-5 and reported in full for the first time again in 2006,

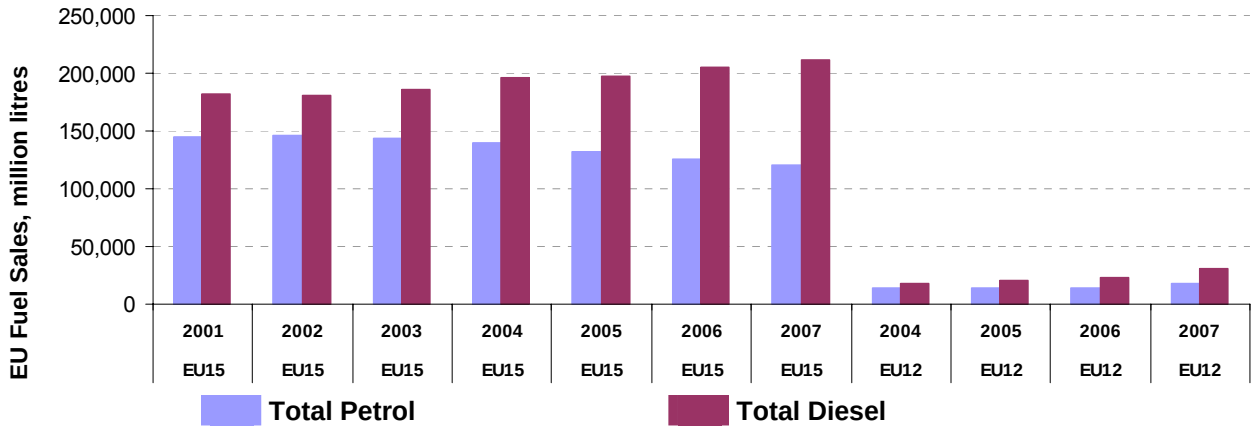
** Malta did not submit in 2006.

### 30.3.2 Fuel sales and sulphur content

The following Figure 30.12 to Figure 30.14 show the trend in total fuel sales and low sulphur fuel sales as a proportion of total sales in the European Union. The sulphur content figures exclude France in 2003 - 2005 (where no submissions are provided). Total sales of petrol and diesel remained approximately constant between 2001 and 2002 (increased 1% for petrol, decreased 0.5% for diesel). EU-wide sales for 2007 show a marked increase in diesel sales since 2001, with an increase of 34% diesel fuel sales in the EU. Petrol fuel sales, on the other have decreased, with a reduction of 5% across the EU.

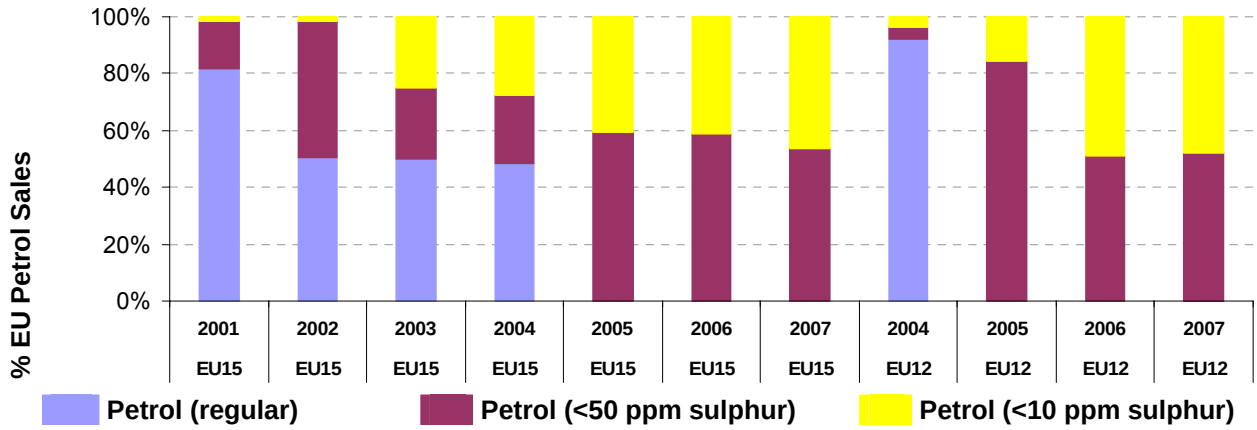
In the EU15 sales of low sulphur (<50 ppm) and sulphur-free (<10 ppm) petrol changed from 28% each of total sales in 2003 to 27% and 31% respectively in 2004. Sales of low sulphur and sulphur free diesel changed from 30% and 25% in 2003 to 32% and 28% in 2004. The limit for sulphur was <50ppm from 2005; 38%, 28% of petrol and diesel sales respectively were sulphur-free fuels in 2005[20], rising to 42% and 31% in 2006. In 2007 percentage of petrol and diesel sulphur-free fuels were 41% and 49% respectively. Of petrol and diesel sales for the EU10 in 2005, 15.5% and 36% respectively were sulphur-free, which rose to 49% and 58% for petrol and diesel respectively in 2006. In 2007 sales of sulphur-free petrol and diesel fuels for EU12 were 41% and 49% respectively.

**Figure 30.12: Temporal trends in EU Sales of petrol and diesel (million litres)***




* France has provided sales data for 2003 – 2005 in its submission for 2006.

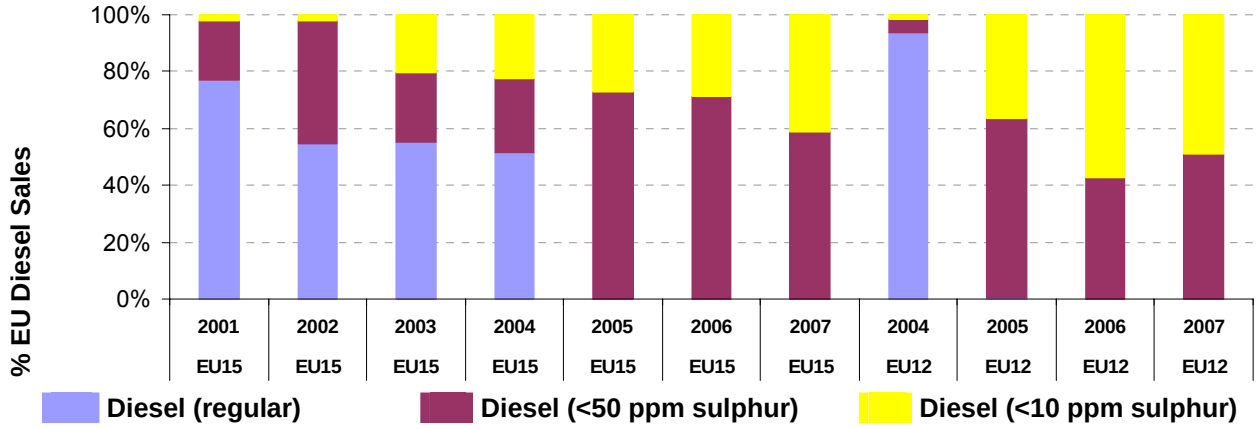
**Figure 30.13: Temporal trends in EU Sales of low sulphur petrol (%)***




* Excludes France in 2003 - 2005, as no submissions were provided.

[20] These figures are slightly lower than those quoted in last years report as they include new sales data submitted from France this year for the 2003-2005 period. This data was previously missing due to lack of reporting for these years by France.

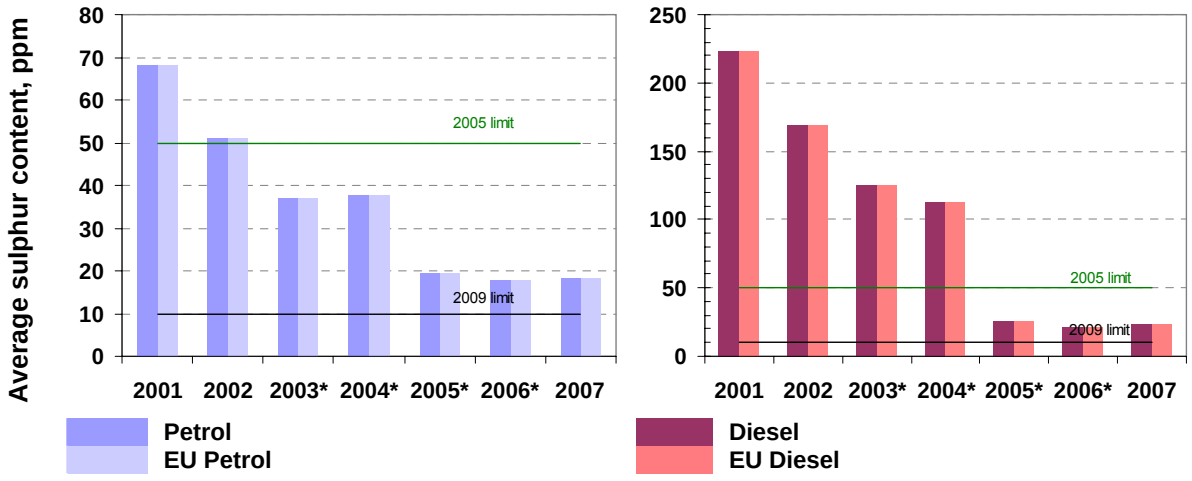
**Figure 30.14: Temporal trends in EU Sales of low sulphur diesel (%)***




* Excludes France in 2003 - 2005, as no submissions were provided.

Figure 3.1 shows the trend in average sulphur content of petrol and diesel fuels (derived from sample analysis results and relative sales). The average sulphur content of both petrol and diesel fuels has decreased since 2001 with levels dropping significantly with the introduction of the mandatory <50 ppm limits for petrol and diesel and increased sales of sulphur-free fuels.

**Figure 30.15: Temporal trends in the average sulphur content (in ppm) of petrol and diesel fuels in sample analysis results from annual monitoring**




* Excludes France in 2003 - 2005, and Malta in 2006, as no report was submitted.

### 30.3.3 Compliance with limit values

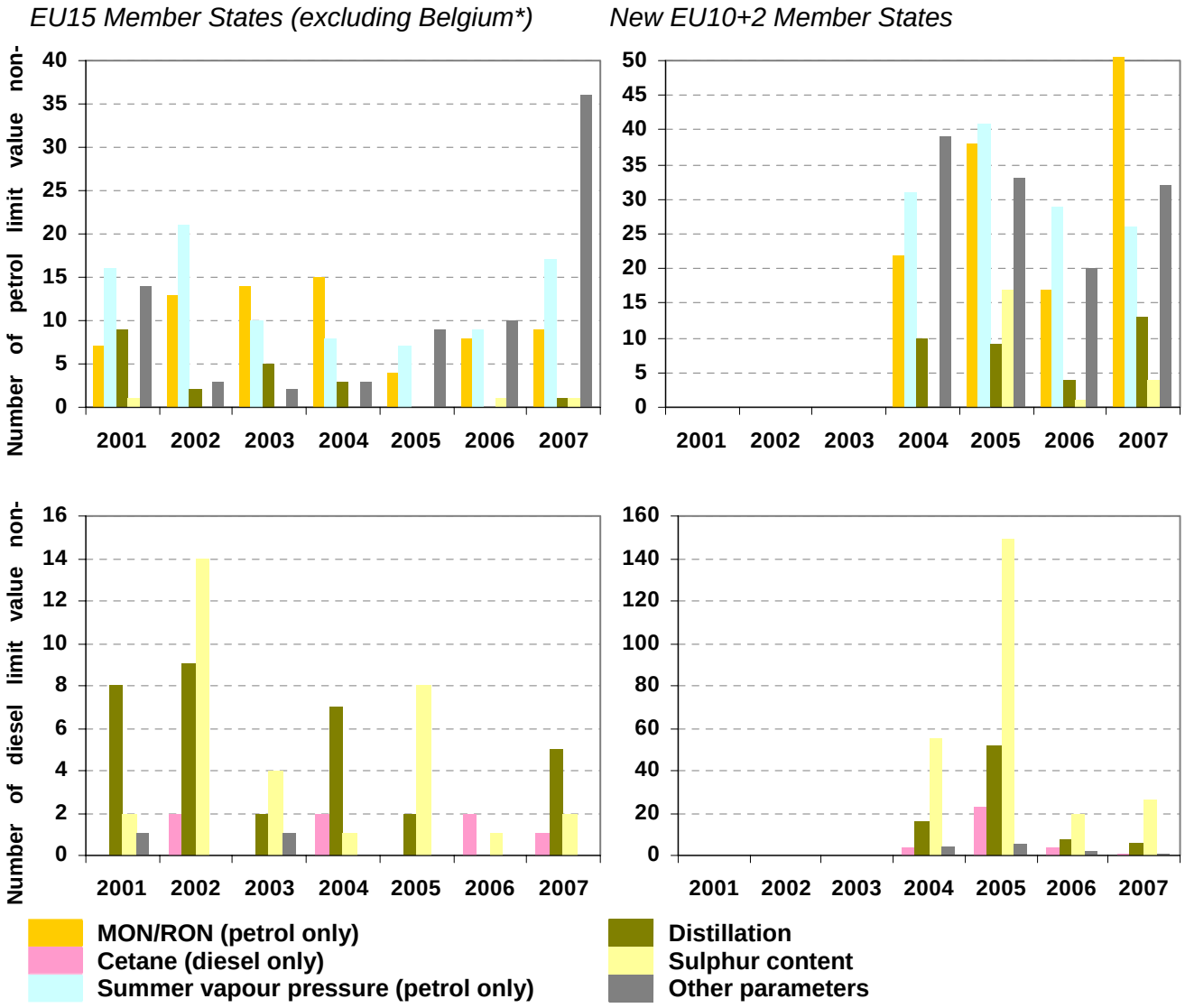
The following Figure 30.16 to Figure 30.17 show the trends in the numbers of limit value non-compliances for petrol and diesel fuels in the European Union. Figures for Belgium are excluded, as the very high sampling rate (and consequent number of non-compliances) and proportion of non-compliant samples hides the underlying trend across the rest of the Member States. The figures show that in the EU15 the numbers and proportion of non-compliant samples is generally decreasing, although there was a big increase in 2007 for petrol. The slight increase in the proportion of non-compliant diesel samples in 2005 due to increased numbers of sulphur limit non-compliances – most likely due to the introduction of the lower sulphur limit from the start of the year. Belgium reported a significantly higher proportion of non-compliant samples compared to other Member States in 2007 at around 3.5% of all samples (no equivalent information has been supplied for 2006). Belgium, however samples and reports on a significantly higher number of fuel samples, however non-road fuels are included in reporting.

The proportion and actual numbers of non-compliances in the new EU10 are larger than in the EU15. The significant numbers of non-compliances from Czech Republic and Poland in previous years has been substantially reduced for 2006, accounting for most of the reduction from overall 2005 non-compliance numbers. The increase between 2004 and 2005 may be partly due to the fact that reporting for 2004 was only for May-December, and partly due to significantly increased sulphur limit breaches with the introduction of <50 ppm mandatory limit in 2005. In general there have significant improvements from the EU10 Member States between 2004 and 2006. In 2007 the number of non-compliant petrol samples double compared to 2006, the proportion of non-compliant diesel sample remain at the same level as in 2006.

**Figure 30.16: Temporal trends in total limit value non-compliances for petrol and diesel fuels**


* Excludes France in 2003 - 2005, as no submissions were provided. Also excludes Belgium, as the very large number of sample analyses (and therefore also non-compliances) hides general trends. The % of non-compliances in Belgium (at around 3.5%) is above other Member States. 2006 excludes Malta, who did not submit the report. 2007 excludes Luxembourg who did not submit the report.

**Figure 30.17: Temporal trends in numbers of samples exceeding limit values for specific petrol and diesel fuel parameters**




* Excludes France in 2003 - 2005, as no submissions were provided. Also excludes Belgium, as the very large number of sample analyses (and therefore also non-compliances) hides general trends.

# 31 Discussion and Conclusion

## 31.1 Discussion

### 31.1.1 2007 Reporting Submissions

***Completeness***

The original format for reporting agreed with Member States was officially established with 'Commission Decision 2002/159/EC of 18/02/2002 on the common format for the submission of summaries of national fuel quality data' (see Appendix 1). In this document it is specified that the first report must be submitted to the European Commission by 30th June 2002 in both paper and electronic formats.

In practice, many submissions received for 2001-2004 reporting were late, with the last received by the end of the year and a number of submissions were not sent in electronic format. In addition, a number of submissions were not entirely complete - the most common deficiency being lack of coverage of all specified fuel quality parameters. Some of these previous submissions also contained insufficient explanation and necessitated further communications with the designated national contact to obtain clarifications. This caused delays to the analysis and reporting for these years and complicated the establishment of compliance with the Directive in some cases.

Since then the completeness of submissions has considerably improved and all those for 2004 - 2007 reporting have been in electronic format. However, whilst most submissions for 2007 reporting were received by, or close to the 30th June deadline (and improved numbers since 2004), a number of Member States had still not reported well after this deadline. This has been particularly problematic this year with several member states delivering reports over 7 months late and the last full report received (from Malta) only in July 2009. This consistent very late delivery clearly undermines the efforts of most Member States to deliver in a more timely fashion. Luxembourg has not submitted a report in 2007.

Extended electronic reporting forms (in Microsoft Excel) were recommended, specified and improved in the 2001-2006 summary reports for the subsequent year's submissions in order to enhance the usefulness of information provided and facilitate more meaningful analysis. Most Member States have provided submissions in this format, even though not required to by the existing Commission Decision, again reducing the need for additional clarifications from Member States and facilitated report production. The numbers submitting in the Excel format is again improved since the previous year.

Responses were received from most Member State contacts for most points of clarification regarding the submission of 2007 monitoring. Cases of specific data gaps in violation of the Commission Decision have been outlined in the previous Member State sections, together with any clarifying information provided in response to queries.

One significant omission still present in most reports from Member States opting to use their own National Systems (as opposed to one based upon EN 14274[21]) is an explanation of the reason for this decision and on the statistical confidence of their National System compared to EN 14274 specifications. Also Member States utilising EN14274 Statistical Model C

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

should in future present a clear rationale for its use on the basis of both number of fuel sources/supply points and size/possibility of division of the territory into regions. This situation has unfortunately not improved since the previous years reporting.

***Fuel Quality Submission Database***

In addition to the preparation of this summary report, a Microsoft Access database was produced containing the basic reporting data and essential information provided by Member States. The database has been constructed to allow for easy input, storage/viewing of submission data, printable reports including both full reported data sets, as well as Member State and EU Summary Reports with a degree of basic analysis and graphical presentation of results and trends. It is anticipated that this database will again be made available to Member States and potentially the wider general public once the 2007 update is complete. In order to take full advantage of the functionality of the database it was also desirable for submissions to follow a more specific structured format in the future, which prompted the recommendation from the previous year's reports for submissions from Member States to be sent within an Excel template (as discussed in the previous section). Use of the template by the majority of Member States in submissions has facilitated accurate updating of the database for 2007 fuel quality.

### 31.1.2 Reporting Format

It was clear from early reporting that there were a number of areas where the reporting format outlined in Commission Decision 2002/159/EC could be improved. The new European Standard (EN 14274) is effective in addressing many of these issues (discussed in section 1.2.3) and agreement was reached on amendments to the reporting format in previous years. The common format for reporting from 2004 was developed in consultation with Member States and other stakeholders; the complete final version of the reporting format is provided in Appendix 4, with an Excel template based upon this sent to Member States by the EC earlier in the year. This process has reduced the need to return to Member States for clarifications or additional information (as discussed in the previous section) in many cases. However, information is still not always provided on non-compliances with limit values, and descriptions of the statistical confidence of National Systems in relation to EN 14274 requirements. Information in previous years was generally poor on the availability of sulphur-free fuels, discussed further in a later section, although it has improved significantly since 2005 reporting.

***Reporting on distillation test analyses***

There has been difficulty in previous years in establishing compliance with distillation limit values, because the test reproducibility (determining the tolerance limits) varies according to each specific analysis. In some cases the individual test's reproducibility has not been available from Member States to confirm whether samples were compliant or not. This issue was raised at previous fuel quality expert meetings and in response CEN precision experts made an extensive analysis of large sets of distillation data of petrol and diesel deriving from national monitoring schemes. This analysis resulted in fixed precision statements (reproducibility) for the distillation characteristics reported in Directive 98/70/EC (4 %(V/V) for petrol distillation at 100$^{o}$C and 150$^{o}$C and 10$^{o}$C for diesel distillation 95% point). CEN recommended in 2005 that these fixed precision statements should be implemented into the EU Fuel Quality Monitoring Submissions Reporting Template and be used to determine compliance where the reproducibility of a specific test is unavailable. This has resulted in clearer and more consistent reporting and evaluation of these test results.

***Reporting on availability and analyses on sulphur-free fuels***

From current indications there are still cases where <10 ppm fuels do not appear to be labelled in certain Member States. This is a problem as it significantly undermines the value

of having fuel meeting this criterion available - without labelling consumers have no possibility to choose sulphur-free fuels, particularly important for owners of vehicles utilising technology that requires them. This lack of labelling may have hampered the introduction of vehicles using technology requiring the fuels before full mandatory introduction in 2009. A result of this could be the full potential offered for reductions in $CO_2$ from the road transport sector not being realised.

Within current reporting requirements, where analyses for sulphur-free grades are not separated out, there will only be an indication of whether fuels comply with the <50 ppm limit value (mandatory from 2005). To give confidence that the fuels sold as sulphur-free comply with this specification it would be useful if Member States reported separately the sulphur content analyses carried out on them. Reporting provisions developed in the 2005 and 2006 Excel Reporting Templates aimed to encourage specific reporting of compliance with the <10 ppm limit value of fuels sold as sulphur-free. Most Member States have utilised this provision to provide separate data for sulphur-free fuels when reporting other parameters together with <50 ppm grades, giving greater assurance that these grades are indeed meeting the <10 ppm requirements.

## 31.2 Conclusion and Recommendations

As set out in the Excel reporting template, revisions to the reporting format outlined in Commission Decision 2002/159/EC and in the European Standard EN 14274: 2003, have enhanced the usefulness of the information and facilitated analysis of EU trends. The quality of the monitoring systems' design, compliance with limit values and information provided in report submissions is continuing to improve in most cases. However, there are still a few key areas for improvement, summarised as follows:

1) Some Member States (including Malta and the UK) have submitted reports extremely late. They are encouraged to report on time to avoid undermining the efforts of others.
2) Similarly, a small number of Member States have reported Fuel Quality monitoring more than three months after the 30th June deadline for 2007 (including Ireland Italy and the Netherlands).
3) Regarding monitoring system and reporting consistency with EN 14274 requirements:
   a) Several Member States do not fulfil sufficient sampling for all fuel or are not sampling in sufficient numbers at refuelling stations (as opposed to depot/refinery).
   b) Where Member States use their own National Systems rather than one based upon the European Standard, there needs to be a description of this system. This description should also provide an assessment that shows the monitoring system's equivalency in statistical confidence to EN 14274: 2003. This has *still* not been provided in most cases for 2004-2007 monitoring and needs to be provided in future.
   c) Where EN 14274 Statistical Model C is used, Member States should present a clear rationale for its use on the basis of both number of fuel sources/supply points and country size /possibility of division of the territory into regions. For several Member States using Model C (and not providing this information) there appears to be a good case on the basis of NUTS regional classification for instead using Model's A or B.
4) In relation to the availability of sulphur free fuels, it is necessary for these fuels to be clearly labelled to ensure that the consumer has the opportunity to choose them. A number of Member States have not implemented a system whereby sulphur content at fuel pumps are clearly labelled. Reporting on labelling could help the automotive industry gain confidence in their availability so that vehicles taking full advantage of the

fuel are more widely introduced.

5) It would also be valuable, for the Member States not already doing so, to report separately (to <50pm fuels) the results of sulphur content analyses that were carried out on fuels sold as sulphur-free to further confirm their quality. These analyses need not be additional to existing sample analyses, but simply a subset of the existing total sampling and analysis requirement as part of their monitoring systems, as provided for in the Excel reporting template.

Following the success of the Excel reporting templates, revised templates for reporting on 2006/7 monitoring were produced, taking into account additional standard test methods introduced in EN 228:2004 and EN 590:2004 and providing an additional line to allow for separate reporting on sulphur content analyses of samples from fuel sold as sulphur-free. There have been no significant changes to the template for 2008 reporting (presented in Appendix 6). The 2008 template will be sent to Member States as in previous years. The use of the template should further assist Member States in their data reporting and again facilitate accurate data collation and analysis for the 2008 summary report.

# Appendices

## CONTENTS

# Appendix 1: Commission Decision of 18/02/2002- 2002/159/EC

# Appendix 2: Directive 98/70/EC: Test Methods, Limit Values and Tolerance Limits

# Directive 98/70/EC: Test Methods, Limit Values and Tolerance Limits*

*Based on information provided by the German Environmental Protection Agency, Italy, Irish EPA and CEN

## Petrol

| Parameter | Unit | 98/70/EC | | Test specified in 98/70/EC or EN 228:1999 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Limit values | | Method | Date | Reproducibility, R | Tolerance limits (95% confidence) | |
| | | Min. | Max. | | | | Minimum | Maximum |
| Research Octane Number (RON) | -- | 95 | | EN-ISO 5164 | 2005 | 0.7 | 94.6 | |
| (RON 91 fuel only) | -- | 91 | | EN-ISO 5164 | 2005 | 0.7 | 90.6 | |
| Motor Octane Number (MON) | -- | 85 | | EN-ISO 5163 | 2005 | 0.9 | 84.5 | |
| (RON 91 fuel only) | -- | 81 | | EN-ISO 5163 | 2005 | 0.9 | 80.5 | |
| Vapour Pressure, DVPE | | | | | | | | |
| --summer period (normal) | kPa | | 60 | EN 13016-1 | 2000 | 3.0 | | 61.8 |
| --summer period (arctic or severe weather conditions) | kPa | | 70 | EN 13016-1 | 2000 | 3.2 | | 71.9 |
| Distillation * | | | | | | | | |
| --evaporated at 100°C | % (v/v) | 46 | | EN-ISO 3405 | 2000 | 4.0* | 43.6 | |
| -- evaporated at 150°C | % (v/v) | 75 | | EN-ISO 3405 | 2000 | 4.0* | 72.6 | |
| Hydrocarbon analysis | | | | | | | | |
| -- Olefins | % (v/v) | | 18.0 | ASTM D1319 | 95a | 4.6 | | 20.7 |
| | | | 18.0 | EN 14517 | 2004 | 2.6 | | 19.5 |
| -- Olefins (RON 91 fuel only) | % (v/v) | | 21.0 | ASTM D1319 | 95a | 5.1 | | 24.0 |
| | | | 21.0 | EN 14517 | 2004 | 3.0 | | 22.8 |
| -- Aromatics | % (v/v) | | 42.0 | ASTM D1319 | 95a | 3.7 | | 44.2 |
| | | | 42.0 | EN 14517 | 2004 | 2.0 | | 43.2 |
| | | | 35.0 | ASTM D1319 | 95a | 3.7 | | 37.2 |
| | | | 35.0 | EN 14517 | 2004 | 1.7 | | 36.0 |
| -- Benzene | % (v/v) | | 1.0 | EN 12177 | 1998 | 0.10 | | 1.06 |
| | | | 1.0 | EN 238 | 1996 | 0.17 | | 1.10 |
| | | | 1.0 | EN 14517 | 2004 | 0.05 | | 1.03 |
| Oxygen content | % (m/m) | | 2.7 | EN 1601 | 1997 | 0.3 | | 2.9 |
| Oxygenates | | | | | | | | |
| -- Methanol | % (v/v) | | 3 | EN 1601 | 1997 | 0.4 | | 3.2 |
| -- Ethanol | % (v/v) | | 5 | EN 1601 | 1997 | 0.3 | | 5.2 |
| -- Iso-propyl alcohol | % (v/v) | | 10 | EN 1601 | 1997 | 0.9 | | 10.5 |
| -- Tert-butyl alcohol | % (v/v) | | 7 | EN 1601 | 1997 | 0.6 | | 7.4 |
| -- Iso-butyl alcohol | % (v/v) | | 10 | EN 1601 | 1997 | 0.8 | | 10.5 |
| -- Ethers with 5 or more carbon atoms per molecule | % (v/v) | | 15 | EN 1601 | 1997 | 1 | | 15.6 |
| -- other oxygenates | % (v/v) | | 10 | EN 1601 | 1997 | 0.8 | | 10.5 |
| Oxygen content | % (m/m) | | 2.7 | EN 13132 | 2000 | 0.3 | | 2.9 |
| Oxygenates | | | | | | | | |
| -- Methanol | % (v/v) | | 3.0 | EN 13132 | 2000 | 0.3 | | 3.2 |
| -- Ethanol | % (v/v) | | 5.0 | EN 13132 | 2000 | 0.4 | | 5.2 |
| -- Iso-propyl alcohol | % (v/v) | | 10.0 | EN 13132 | 2000 | 0.8 | | 10.5 |
| -- Tert-butyl alcohol | % (v/v) | | 7.0 | EN 13132 | 2000 | 0.5 | | 7.3 |
| -- Iso-butyl alcohol | % (v/v) | | 10.0 | EN 13132 | 2000 | 0.8 | | 10.5 |
| -- Ethers with 5 or more carbon atoms per molecule | % (v/v) | | 15.0 | EN 13132 | 2000 | 1 | | 15.6 |
| -- other oxygenates | % (v/v) | | 10.0 | EN 13132 | 2000 | 0.8 | | 10.5 |
| Sulphur content | mg/kg | | 150 | EN ISO 14596 | 1998 | 30 | | 168 |
| | | | 150 | EN ISO 8754 | 1995 | CEN: Not suitable for fuels 150ppm and below*** | | |
| | | | 150 | EN 24260 | 1994 | 18.6 | | 161 |
| | | | 150 | EN ISO 20846 | 2004 | 25.6 | | 165.1 |
| | | | 150 | EN ISO 20847 | 2004 | 27.7 | | 166.3 |
| | | | 150 | EN ISO 20884 | 2004 | 15.9 | | 159.4 |
| Sulphur content (low sulphur, from 2005) | mg/kg | | 50 | EN ISO 14596 | 1998 | 20 | | 62 |
| | | | 50 | EN ISO 8754 | 1995 | CEN: Not suitable for fuels 150ppm and below*** | | |
| | | | 50 | EN 24260 | 1994 | 6.8 | | 54 |
| | | | 50 | EN ISO 20846 | 2004 | 9.7 | | 55.7 |
| | | | 50 | EN ISO 20847 | 2004 | 16.6 | | 59.8 |
| | | | 50 | EN ISO 20884 | 2004 | 7.9 | | 54.7 |

## Petrol

| Parameter | Unit | 98/70/EC | | Test specified in 98/70/EC or EN 228:1999 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Limit values | | Method | Date | Reproducibility, R | Tolerance limits (95% confidence) | |
| | | Min. | Max. | | | | Minimum | Maximum |
| Sulphur content (sulphur free, from 2005) | mg/kg | | 10 | EN ISO 14596 | 1998 | 5 | | 13 |
| | | | 10 | EN 24260 | 1994 | 3.4 | | 12 |
| | | | 10 | EN ISO 20846 | 2004 | 2.7 | | 11.6 |
| | | | 10 | EN ISO 20884 | 2004 | 3.1 | | 11.8 |
| Lead content | g/l | | 0.005 | EN 237 | 1996 | 0.002 | | 0.0062 |
| | | | 0.005 | EN 237 | 2004 | 0.00062 | | 0.0054 |

* R values and limits are fixed precision statements provided by CEN, to be used in the absence of specific values from Member States. Member States may use and report their own defined R depending on their testing conditions.

***According to CEN/TR 15139: August 2005 - "Petroleum products and other liquids - Applicability of test methods on sulphur determination in petrol and diesel fuel", the test method EN ISO 8754 is not suitable for determining the sulphur content of petrol or diesel fuels at or below 150ppm and 350ppm, respectively. This is because the method does not comply with the tolerance limit guidance according to EN ISO 4259.

## Diesel

| Parameter | Unit | 98/70/EC | | Test specified in 98/70/EC or EN 590:1999 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Limit values | | Method | Date | Reproducibility, R | Tolerance limits (95% confidence) | |
| | | Min. | Max. | | | | Minimum | Maximum |
| Cetane number | -- | 51.0 | -- | EN-ISO 5165 | 1998 | 4.3 | 48.5 | |
| Density at 15°C | kg/m$^3$ | | 845 | EN-ISO 3675 | 1998 | 1.2 | | 845.7 |
| | | | | EN ISO 12185 | 1996 | 0.5 | | 845.3 |
| Distillation -- 95% Point | °C | | 360 | EN-ISO 3405 | 1988 | 10.0* | | 365.9 |
| Polycyclic aromatic hydrocarbons | % (m/m) | | 11 | IP 391 | 1995 | 3.8 | | 13.2 |
| Sulphur content | mg/kg | | 350 | EN ISO 14596 | 1998 | 50.0 | | 379.5 |
| | | | 350 | EN 24260 | 1994 | 42.4 | | 375.0 |
| | | | 350 | EN ISO 20846 | 2004 | 40.0 | | 373.6 |
| | | | 350 | EN ISO 20847 | 2004 | 17.9 | | 360.6 |
| | | | 350 | EN ISO 20884 | 2004 | 30.9 | | 368.2 |
| Sulphur content (low sulphur, from 2005) | mg/kg | | 50 | EN ISO 14596 | 1998 | 20.0 | | 62 |
| | | | 50 | EN 24260 | 1994 | 6.8 | | 54.0 |
| | | | 50 | EN ISO 20846 | 2004 | 6.7 | | 54.0 |
| | | | 50 | EN ISO 20847 | 2004 | 12.8 | | 57.6 |
| | | | 50 | EN ISO 20884 | 2004 | 7.9 | | 54.7 |
| Sulphur content (sulphur free, from 2005) | mg/kg | | 10 | EN ISO 14596 | 1998 | 5.0 | | 13.0 |
| | | | 10 | EN 24260 | 1994 | 3.4 | | 12.0 |
| | | | 10 | EN ISO 20846 | 2004 | 2.2 | | 11.3 |
| | | | 10 | EN ISO 20884 | 2004 | 3.1 | | 11.8 |

# Appendix 3: 2007 Member State Fuel Quality Submission Tables

## CONTENTS

# Introduction to Appendix 3 Reporting Tables

The following tables represent the output from the Fuel Quality Summary database, produced as part of this work.

**Notes 1:**
Where Member States have reported that parameter values are below the limit of detection for a particular test method (e.g. "<X"), these have been entered in the Microsoft Access database as "0" (and hence the tables in this Appendix), with a footnote in the notes accompanying the analysis table stating that the limit of detection for the specific test method is "X"(and therefore values reported as "0" will fall into the range "0 – X").

**Notes 2:**
In cases where separate reporting tables for summer and winter period sampling were provided, data were combined in the following manner for each of the parameters for the full-year dataset:

Number of samples (N): direct sum of the two values;

Minimum: the lowest of the two values;

Maximum: the highest of the two values;

Mean (m): Mean of 2 data sets = $((m_1*n_1) + (m_2*n_2)) / N$

Where:
N = total number of samples
$m_1$ = mean data set 1, $m_2$ = mean data set 2
$n_1$ = no. samples in data set 1, $n_2$ = no. samples in data set 2

In accordance with:
Mean = sum of sample values / number of samples

# Appendix 4: Fuel Quality Monitoring Reporting Format from 2004

# Common Format for the Submission of Summaries of National Fuel Quality Data for Petrol and Diesel from 2004

## 1. INTRODUCTION

Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Directive 93/12/EEC[22], as last amended by Directive 2003/17/EC[23], sets the environmental specifications for all petrol and diesel fuel marketed in the European Union. These specifications can be found in Annexes I to IV of the Directive. Article 8(1) obliges the Member States to monitor the compliance with these fuel quality specifications according to the analytical measurement methods referred to in the Directive.

By no later than 30 June each year the Member States must submit a summary of the fuel quality monitoring data collected during the period January to December of the previous calendar year. The first report was to be made by 30 June 2002, in the format specified under Commission Decision 2002/159/EC[24].

From 2004 Member States are required to report according to the requirements of the European Standard EN 14274: 2003[25], unless they are using national fuel quality monitoring systems of equivalent confidence. In addition from 2005 Member States are required to phase in "sulphur free" petrol and diesel fuels on an appropriately balanced geographical basis.

This reporting format for 2004 reporting onwards contained herein is proposed to attempt to harmonise reporting submissions across the Member States whether they are using either the European Standard or their own national systems. This optional format essentially summarises information already required or requested under the Directive and European Standard. Text and fields in red are additional information requested beyond the mandatory requirements outlined in the Directive.

## 2. DETAILS OF THOSE COMPILING THE FUEL QUALITY MONITORING REPORT

The authorities responsible for compiling the fuel quality monitoring report are requested to complete the table below.

| | |
|---|---|
| **Reporting Year:** | |
| **Country:** | |
| **Date Report Completed:** | |
| **Organisation Responsible for Report:** | |
| **Address of Organisation:** | |
| **Person Responsible for Report:** | |
| **Telephone Number:** | |
| **Email:** | |

## 3. DEFINITIONS AND EXPLANATION

*Parent fuel grade*: Directive 98/70/EC sets the environmental specifications for petrol and

[22] OJ L 350, 28.12.1998, p. 58.
[23] OJ L76/10, 22.3.2003, p. 10
[24] O.J. L 53 of 23.2.2002, p.30
[25] EN 14274:2003 - Automotive fuels - Assessment of petrol and diesel quality - Fuel Quality Monitoring System (FQMS).

diesel fuel marketed in the EU. The specifications in the Directive can be thought of as 'parent fuel grades'. These include (i) regular unleaded petrol (RON > 91), (ii) unleaded petrol (RON > 95) and (iii) diesel fuel.
*National fuel grade*: Member States may, of course, define 'national' fuel grades, which must still, however, respect the specification of the parent fuel grade. For example, national fuel grades may comprise super unleaded petrol (RON > 98), lead replacement petrol, zero sulphur petrol, <50 ppm sulphur petrol, zero sulphur diesel, <50 ppm sulphur diesel, etc.
*Zero sulphur or sulphur-free fuels* are petrol and diesel fuels that contain less than 10 mg/kg (ppm) of sulphur.

## 4. DESCRIPTION OF FUEL QUALITY MONITORING SYSTEM

Member States should provide details on the operation of their national fuel quality monitoring systems.

Directive 98/70/EC requires the vapour pressure of petrol to be less than 60.0 kPa during the summer period, which spans 1 May until 30 September. However, for those Member States that experience 'arctic or severe weather conditions' the summer period covers the period 1 June to 31 August and the vapour pressure must not exceed 70 kPa. Member States are requested to define the Summer/Winter periods implemented in their territories and also applying to their fuel quality monitoring system reporting.

| | | |
|---|---|---|
| **Summer Period** | | |
| | *Start* | |
| | *End* | |
| **Winter Period** | | |
| | *Start* | |
| | *End* | |

Member States should indicate whether their monitoring system is set up using the European Standard EN 14274:2003 statistical model A, B or C and whether it is based on the large or small country framework. Alternatively, the Member State should indicate if they are using their own nationally defined system.

| | |
|---|---|
| **Country Size (L = Large, S = Small):** | |

| | | **Minimum number of samples (Petrol, per grade; Diesel)** | |
|---|---|---|---|
| **Fuel Quality Monitoring System model:** | **Yes/No** | **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 | | -- | -- |

If Member States **are** using the European Standard EN 14274:2003, they should also provide details on the sampling programme by completing the relevant sections of the table in Annex I (as defined in Annexes B and C of EN 14274:2003), plus details of any additional provisions made in the table below.

If Member States **are not** using the European Standard EN 14274:2003 and are using their own national system, they should provide a description of the operation of their national fuel quality monitoring systems. This should preferably include the following information, in addition to any additional information that the Member State thinks is relevant (e.g. number of national refineries and distribution terminals):

- Organisations responsible for sampling, analysis and reporting;
- Types of locations at which sampling is carried out (e.g. refineries, terminals/depots, or from refuelling stations);
- Frequency of sampling and selection of sampling points;
- Assessment that shows the monitoring system's equivalency to the CEN system.

| **Description of National Fuel Quality Monitoring System (give once and up-date if necessary):** |
|---|
| |

5. TOTAL SALES OF PETROL & DIESEL

Member States are requested to complete the following table detailing the quantities of each type and grade of petrol and diesel fuel marketed in their territory.

| **Parent or National Fuel Grade** | **National Sales Total (Litres/Tonnes)** | **No. Samples Taken** |
|---|---|---|
| Regular unleaded petrol (minimum RON=91) (1) | | |
| Regular unleaded petrol (minimum RON=91 & <50 ppm sulphur) | | |
| Regular unleaded petrol (minimum RON=91 & <10 ppm sulphur) | | |
| Unleaded petrol (minimum RON=95) (1) | | |
| Unleaded petrol (minimum RON=95 & <50 ppm sulphur) (2) | | |
| Unleaded petrol (minimum RON=95 & <10 ppm sulphur) (3) | | |
| Unleaded petrol (minimum 95=<RON<98) | | |
| Unleaded petrol (minimum 95=<RON<98 & <50 ppm sulphur) | | |
| Unleaded petrol (minimum 95=<RON<98 & <10 ppm sulphur) | | |
| Unleaded petrol (minimum RON>=98) | | |
| Unleaded petrol (minimum RON>=98 & <50 ppm sulphur) | | |
| Unleaded petrol (minimum RON>=98 & <10 ppm sulphur) | | |
| Diesel fuel (4) | | |
| Diesel fuel (<50 ppm sulphur) (5) | | |
| Diesel fuel (<10 ppm sulphur) (6) | | |

(1) as specified in Annex I of Directive 98/70/EC
(2) as specified in Annex III of Directive 98/70/EC
(3) as specified in Annex III of Directive 98/70/EC except the sulphur content which must be less than 10ppm
(4) as specified in Annex II of Directive 98/70/EC
(5) as specified in Annex IV of Directive 98/70/EC
(6) as specified in Annex IV of Directive 98/70/EC except the sulphur content which must be less than 10ppm

6. GEOGRAPHICAL AVAILABILITY OF SULPHUR-FREE FUELS

Member States are requested to complete the following tables with basic information on the geographical availability of sulphur free petrol and diesel sold in their territories.

| | (Litres/Tonnes) | % Total Petrol/Diesel Sales |
|---|---|---|
| **Total National sales <10 ppm sulphur petrol** | | |
| **Total National sales <10 ppm sulphur diesel** | | |

| **Details of petrol RON grades available with <10 ppm sulphur:** |
|---|
| |
| **Are <10 ppm sulphur fuels (petrol and/or diesel) labelled differently from regular grades (i.e. can they be easily distinguished from regular/higher sulphur fuels by the consumer)?** |
| |

Where Member States choose to apply the measures in their national territories, they are also requested to complete, as far as possible, the following tables with detailed information (Options A to D) on the geographical availability of sulphur free petrol and diesel in their territories, as outlined in the Commission Guidance note[26]. Member States should also take into account any specific provisions made for special cases in the Commission Guidance.

Where the more detailed information is not available, or additional notes/clarifications are needed or other guidance than that given by the Commission is used, the Member States are requested to provide a description on the extent to which sulphur free fuels are marketed in their territory (i.e. geographical availability). This free form text box should also be used to provide any additional information such as the special cases outlined in the Commission Guidance note.

| **Description of the geographical availability of sulphur free fuels or additional notes:** |
|---|
| |

Option (A): Proportion of refuelling stations with sulphur free grades available by region

See Annex II for reporting table format.

[26] The more detailed reporting on geographical availability is not needed until the 2005 monitoring reports, but would be useful if Member States were also able to provide it from 2004.

Option (B): Average distance between refuelling stations with sulphur free grades available

| | No. Refuelling Stations | | Distance between refuelling stations (km) | | | |
|---|---|---|---|---|---|---|
| | <10 ppm | All | With <10 ppm grades available | | | All |
| | Number | Number | Min. | Max. | Mean | Mean |
| **Petrol** | | | | | | |
| **Diesel** | | | | | | |

Option (C): Availability of sulphur free fuels at large refuelling stations

| | Petrol | Diesel |
|---|---|---|
| National criteria for definition of *"large refuelling stations"* in terms of a minimum volume throughput (in million litres / annum) | | |
| Total number of large refuelling stations nationally | | |
| Number of large refuelling stations with <10 ppm fuel available | | |
| % Total large refuelling stations with <10 ppm fuel available | | |

Option (D): Availability of sulphur free fuels at highway/motorway refuelling stations

| | Petrol | Diesel |
|---|---|---|
| Total number of highway/motorway refuelling stations nationally | | |
| Number of highway/motorway refuelling stations with <10 ppm fuel available | | |
| % Total highway/motorway refuelling stations with <10 ppm fuel available | | |

## 7. SUMMARY REPORTING FORMAT FOR PETROL & DIESEL

Member States are requested to provide a brief general summary of the results of the year's monitoring, including information on any:

- other parameters measured;
- exclusions;
- further details on breaches of parameter tolerance limits (i.e. number of samples, values);
- enforcement actions taken as a result of breaches of the limit values/tolerance limits; and
- additional information deemed relevant.

In particular, Member States should provide additional explanatory information on reasoning for exceptional cases where exclusions are made, such as:

- fuel grades marketed in very small quantities;
- mandatory fuel parameters that are not measured;
- geographical areas that are left outside the monitoring programme;
- exceptionally high or low values of analytical results (i.e. outliers).

| General Summary of Analysis and Additional Information: |
| --- |
| |

8. REPORTING FORMAT FOR PETROL

Member States should also submit a detailed summary report for petrol quality monitoring data (for both nationally defined and parent grades) that they have collected in a given calendar year (January to December). This summary table format is attached as Appendix III for 2004 and Appendix V for 2005 onwards. Test methods shall be those included in EN 228: 1999 or later versions as appropriate.

9. REPORTING FORMAT FOR DIESEL

Member States should also submit a detailed summary report for diesel quality monitoring data (for both nationally defined and parent grades) that they have collected in a given calendar year (January to December). This summary table format is attached as Appendix IV for 2004 and Appendix VI for 2005 onwards. Test methods shall be those included in EN 590: 1999 or later versions as appropriate.

10. SUBMISSION OF FUEL QUALITY MONITORING REPORT

The fuel quality monitoring report should be submitted formally to the following person:
The Secretary General
The European Commission
Rue de la Loi/Wetstraat 200
B-1049 Brussels.

In addition, the report should be submitted in electronic form to the following email address: env-report-98-70@cec.eu.int

## ANNEX I: Fuel Quality Monitoring System Regional Sampling of Petrol and Diesel [1]

| | |
|---|---|
| **Country:** | |
| **Fuel type (petrol or diesel):** | |
| **Statistical Model (A, B or C)** [2] | |
| **Period and Year** | |

| | Macro / Non-Macro Regions (add extra rows as needed) | Fuel Consumption (million tonnes) | Variability Factor [3] | Proportion of total samples | Min. number of Samples per grade | Actual number of samples taken | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Grade: | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Grade 5 |
| | | | | | | Name/ID: | | | | | |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| | **Total** | | | | | | | | | | |

(1) As defined in Annexes B and C of EN 14274:2003
(2) Definitions according to those provided in EN 14274:2003.
(3) Only for statistical Model A

**ANNEX II: Options (A) - Proportion of Refuelling Stations with Sulphur Free Grade Available by Region [(1)]**

| | |
|---|---|
| **Country:** | |
| **Fuel type (petrol or diesel):** | |
| **Period and Year** | |

| **Regional Parameters** | | | | **Regional availability (NUTS Level 3) of sulphur free fuel at refuelling stations [(2)]** | | |
|---|---|---|---|---|---|---|
| **NUTS Region Description [(2)]** | | **NUTS Code [(2)]** | **No. of refuelling stations** | **Minimum %** | **Maximum %** | **Mean %** |
| **LEVEL 2 Regions** | | -- | -- | -- | -- | -- |
| **Region 1** | | E.g. XX11 | | | | |
| **Region 2** | | E.g. XX12 | | | | |
| **Region 3** | | E.g. XX13 | | | | |
| **Etc.** | | E.g. XX21 | | | | |
| | | E.g. XX22 | | | | |
| | | E.g. XX31 | | | | |
| *<insert extra rows as needed>* | | | | | | |
| **LEVEL 1 Regions** | | -- | -- | -- | -- | -- |
| **Region 1** | | E.g. XX1 | | | | |
| **Region 2** | | E.g. XX2 | | | | |
| **Etc.** | | E.g. XX3 | | | | |
| *<insert extra rows as needed>* | | | | | | |
| **National Total** | | **E.g. XX** | | | | |

(1) According to the Eurostat Nomenclature of territorial units for statistics – NUTS Statistical Regions of Europe (see: http://europa.eu.int/comm/eurostat/ramon/nuts/home_regions_en.html)

(2) Additional information on NUTS, including full country code listings, may be found on the Eurostat web site at: http://europa.eu.int/comm/eurostat/ramon/nuts/home_regions_en.html

**Additional Comments:**

## ANNEX III: Market Fuels Used in Vehicles with Spark Ignition Engines (Petrol) in 2004

| | |
|---|---|
| **Country** | |
| **Fuel grade:** | |
| **National specification:** | |
| **Period and Year:** | |

| **Parameter** | **Unit** | **Analytical and statistical results** | | | | | **Limiting value** [1] **National Specification, if any** | | **According to 98/70/EC** | | **Test method (more recent versions may also be used)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **No. of Samples** | **Min.** | **Max.** | **Mean** | **Standard Deviation** | **Min.** | **Max.** | **Min.** | **Max.** | **Method** | **Date** |
| **Research Octane Number** | -- | | | | | | | -- | 95 [2] | -- | EN 25164 | 1993 |
| **Motor Octane Number** | -- | | | | | | | -- | 85 [3] | -- | EN 25163 | 1993 |
| **Vapour pressure, DVPE** | kPa | | | | | | | | -- | 60.0 [4] | PrEN 13016-1 | 1997 |
| **Distillation:** | | | | | | | | | | | | |
| **- evaporated at 100 °C** | %(V/V) | | | | | | | | 46.0 | -- | PrEN ISO 3405 | 1999 |
| **- evaporated at 150 °C** | %(V/V) | | | | | | | | 75.0 | -- | | |
| **Hydrocarbon Analysis:** | | | | | | | | | | | | |
| **- olefins** | %(V/V) | | | | | | | | | 18.0 [5] | ASTM D 1319 | 1995 |
| **- aromatics** | %(V/V) | | | | | | | | -- | 42.0 | ASTM D 1319 | 1995 |
| **- benzene** | %(V/V) | | | | | | | | | 1.0 | EN 238 | 1996 |
| **Oxygen content** | % (m/m) | | | | | | | | -- | 2.7 | EN 1601<br>PrEN 13132 | 1997<br>1998 |
| **Oxygenates:** | | | | | | | | | | | | |
| **- Methanol** | %(V/V) | | | | | | | | -- | 3 | | |
| **- Ethanol** | %(V/V) | | | | | | | | -- | 5 | | |
| **- Iso-propyl alcohol** | %(V/V) | | | | | | | | -- | 10 | EN 1601 | 1997 |
| **- Tert-butyl alcohol** | %(V/V) | | | | | | | | -- | 7 | Or | |
| **- Iso-butyl alcohol** | %(V/V) | | | | | | | | -- | 10 | prEN 13132 | 1998 |
| **-Ethers containing 5 or more carbon atoms per molecule** | %(V/V) | | | | | | | | -- | 15 | | |
| **- other oxygenates** | %(V/V) | | | | | | | | -- | 10 | | |
| **Sulphur content** | mg/kg | | | | | | | | -- | 150 | EN ISO 14596<br>EN ISO 8754<br>EN 24260 | 1998<br>1995<br>1994 |
| **Lead content** | g/l | | | | | | | | -- | 0.005 | EN 237 | 1996 |

| **Sample Numbers in Month** | | | | | | **Total:** | |
|---|---|---|---|---|---|---|---|
| **January** | | **April** | | **July** | | **October** | |
| **February** | | **May** | | **August** | | **November** | |
| **March** | | **June** | | **September** | | **December** | |

| **Comments** |
|---|
| |

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.

(2) 91 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.

(3) 81 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.

(4) 70 kPa for Member States with arctic or severe weather conditions: See 98/70/EC, Annex I, Footnotes 4 and 5.

(5) 21 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 6.

## ANNEX IV: Market Fuels Used in Vehicles with Compression Ignition Engines (Diesel) in 2004

| | |
|---|---|
| **Country** | |
| **Fuel grade:** | |
| **National specification:** | |
| **Period and Year:** | |

| Parameter | Unit | Analytical and statistical results | | | | | Limiting value (1) National Specification, if any | | According to 98/70/EC | | Test method (more recent versions may also be used) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | Min. | Max. | Mean | Standard Deviation | Min. | Max. | Min. | Max. | Method | Date |
| **Cetane number** | -- | | | | | | | | 51.0 | -- | EN ISO 5165 | 1998 |
| **Density at 15 °C (2)** | $Kg/m^3$ | | | | | | | | -- | 865 | EN ISO 3575<br>EN ISO 12185 | 1998<br>1996 |
| **Distillation, 95% Point** | °C | | | | | | | | -- | 360 | PrEN ISO 3405 | 1998 |
| **Polycyclic aromatic hydrocarbons (PAH) (3)** | %(m/m) | | | | | | | | -- | 11 | IP 391 | 1995 |
| **Sulphur content (4)** | mg/kg | | | | | | | | -- | 350 | EN ISO 14596<br>EN ISO 8754<br>EN 24260 | 1998<br>1995<br>1994 |

| Sample Numbers in Month | | | |
|---|---|---|---|
| **January** | | **July** | |
| **February** | | **August** | |
| **March** | | **September** | |
| **April** | | **October** | |
| **May** | | **November** | |
| **June** | | **December** | |
| | | **Total:** | |

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.

(2) In cases of dispute EN ISO 3675: 1998 shall be used

(3) Polycyclic aromatic hydrocarbons are defined as the total aromatic hydrocarbon content less than the mono-aromatic hydrocarbons content, both as determined by IP 391

(4) In cases of dispute EN ISO 14596: 1998 shall be used

**Comments**

## ANNEX V: Market Fuels Used in Vehicles with Spark Ignition Engines (Petrol) from 2005

| | |
|---|---|
| **Country** | |
| **Fuel grade:** | |
| **National specification:** | |
| **Period and Year:** | |

| **Parameter** | **Unit** | **Analytical and statistical results** | | | | | **Limiting value** [1] **National Specification, if any** | | **According to 98/70/EC** | | **Test method (more recent versions may also be used)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **No. of Samples** | **Min.** | **Max.** | **Mean** | **Standard Deviation** | **Min.** | **Max.** | **Min.** | **Max.** | **Method** | **Date** |
| **Research Octane Number** | -- | | | | | | | -- | 95 [2] | -- | EN 25164 | 1993 |
| **Motor Octane Number** | -- | | | | | | | -- | 85 [3] | -- | EN 25163 | 1993 |
| **Vapour pressure, DVPE** | kPa | | | | | | | | -- | 60.0 [4] | PrEN 13016-1 | 1997 |
| **Distillation:** | | | | | | | | | | | | |
| **- evaporated at 100 °C** | %(V/V) | | | | | | | | 46.0 | -- | PrEN ISO 3405 | 1999 |
| **- evaporated at 150 °C** | %(V/V) | | | | | | | | 75.0 | -- | | |
| **Hydrocarbon Analysis:** | | | | | | | | | | | | |
| **- olefins** | %(V/V) | | | | | | | | | 18.0 [5] | ASTM D 1319 | 1995 |
| **- aromatics** | %(V/V) | | | | | | | | -- | 35.0 | ASTM D 1319 | 1995 |
| **- benzene** | %(V/V) | | | | | | | | | 1.0 | EN 238 | 1996 |
| **Oxygen content** | % (m/m) | | | | | | | | -- | 2.7 | EN 1601<br>PrEN 13132 | 1997<br>1998 |
| **Oxygenates:** | | | | | | | | | | | | |
| **- Methanol** | %(V/V) | | | | | | | | -- | 3 | | |
| **- Ethanol** | %(V/V) | | | | | | | | -- | 5 | | |
| **- Iso-propyl alcohol** | %(V/V) | | | | | | | | -- | 10 | EN 1601 | 1997 |
| **- Tert-butyl alcohol** | %(V/V) | | | | | | | | -- | 7 | Or | |
| **- Iso-butyl alcohol** | %(V/V) | | | | | | | | -- | 10 | prEN 13132 | 1998 |
| **-Ethers containing 5 or more carbon atoms per molecule** | %(V/V) | | | | | | | | -- | 15 | | |
| **- other oxygenates** | %(V/V) | | | | | | | | -- | 10 | | |
| **Sulphur content** | mg/kg | | | | | | | | -- | 50 | EN ISO 14596<br>EN ISO 8754<br>EN 24260 | 1998<br>1995<br>1994 |
| **Lead content** | g/l | | | | | | | | -- | 0.005 | EN 237 | 1996 |

| **Sample Numbers in Month** | | | | | | **Total:** | |
|---|---|---|---|---|---|---|---|
| **January** | | **April** | | **July** | | **October** | |
| **February** | | **May** | | **August** | | **November** | |
| **March** | | **June** | | **September** | | **December** | |

| **Comments** |
|---|
| |

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.

(2) 91 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.

(3) 81 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.

(4) 70 kPa for Member States with arctic or severe weather conditions: See 98/70/EC, Annex I, Footnotes 4 and 5.

(5) 21 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 6.

## ANNEX VI: Market Fuels Used in Vehicles with Compression Ignition Engines (Diesel) from 2005

| | |
|---|---|
| **Country** | |
| **Fuel grade:** | |
| **National specification:** | |
| **Period and Year:** | |

| Parameter | Unit | Analytical and statistical results | | | | | Limiting value [1] National Specification, if any | | According to 98/70/EC | | Test method (more recent versions may also be used) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | Min. | Max. | Mean | Standard Deviation | Min. | Max. | Min. | Max. | Method | Date |
| **Cetane number** | -- | | | | | | | | 51.0 | -- | EN ISO 5165 | 1998 |
| **Density at 15 °C [2]** | $Kg/m^3$ | | | | | | | | -- | 865 | EN ISO 3575<br>EN ISO 12185 | 1998<br>1996 |
| **Distillation, 95% Point** | °C | | | | | | | | -- | 360 | PrEN ISO 3405 | 1998 |
| **Polycyclic aromatic hydrocarbons (PAH) [3]** | %(m/m) | | | | | | | | -- | 11 | IP 391 | 1995 |
| **Sulphur content [4]** | mg/kg | | | | | | | | -- | 50 | EN ISO 14596<br>EN ISO 8754<br>EN 24260 | 1998<br>1995<br>1994 |

| Sample Numbers in Month | | | |
|---|---|---|---|
| **January** | | **July** | |
| **February** | | **August** | |
| **March** | | **September** | |
| **April** | | **October** | |
| **May** | | **November** | |
| **June** | | **December** | |
| | | **Total:** | |

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.

(2) In cases of dispute EN ISO 3675: 1998 shall be used

(3) Polycyclic aromatic hydrocarbons are defined as the total aromatic hydrocarbon content less than the mono-aromatic hydrocarbons content, both as determined by IP 391

(4) In cases of dispute EN ISO 14596: 1998 shall be used

**Comments**

# Appendix 5: Commission Recommendation 2005/27/EC

# Appendix 6: 2007 Excel Reporting Template

The Gemini Building
Fermi Avenue
Harwell International Business Centre
Didcot
Oxfordshire
OX11 0QR

Tel: 0845 345 3302
Fax: 0870 190 6318

E-mail: info@aeat.co.uk

**www.aeat.co.uk**