



COMMISSION OF THE EUROPEAN COMMUNITIES

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2001/0107 (COD)

Proposal for a

**DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**

**on the quality of petrol and diesel fuels and amending Directive 98/70/EC**

(presented by the Commission)

## **EXPLANATORY MEMORANDUM**

### **1. INTRODUCTION**

The purpose of this proposal is to complete the environmental specifications for petrol and diesel fuels in accordance with Article 9 of Directive 98/70/EC<sup>1</sup>. This Directive contains fuel quality specifications which enter into force in two stages, the first on the 1<sup>st</sup> January 2000 and the second on the 1<sup>st</sup> January 2005. However, the specification for 2005 is incomplete and so must be completed as a matter of some urgency in order to provide regulatory clarity to the fuel producers and vehicle manufacturers. In preparing this proposal the Commission has also undertaken an analysis of the need to reduce further the level of sulphur in petrol and diesel below the 50 mg/kg (parts per million or ppm) level already mandated for 2005.

### **2. BACKGROUND**

#### **2.1. The Auto-Oil programmes**

The aim of the first Auto-Oil Programme (Auto-Oil I) was to provide the technical basis for a legislative proposal on fuel quality which would take effect in the year 2000. However, when finally adopted, Directive 98/70/EC contained a full complement of environmental specifications for 2000 and a limited number for 2005 as well. The specifications for 2005 included a maximum permissible limit on the sulphur content of petrol and diesel (50 ppm) and the aromatic content of petrol (35% by volume).

The Auto-Oil II programme was launched in order to prepare the analytical basis for vehicle emissions and fuels standards for the year 2005. As explained above, the programme was overtaken, somewhat, by the political agreement on the Auto-Oil I vehicles and fuels Directives. As a consequence Auto-Oil II did not investigate the impacts of sulphur on road transport emissions (and air quality) and took as fixed the sulphur limits for petrol and diesel in 2005.

A communication outlining the results of the Auto-Oil II programme was published recently<sup>2</sup>. Air quality modelling, using predicted changes in emissions, suggests that large improvements in urban air quality can be expected by 2010, although several environmental objectives will still not be met. Among the pollutants studied, the most important remaining challenges concern particulate matter, regional tropospheric ozone levels and some localised exceedences of nitrogen dioxide targets.

#### **2.2. Council conclusions on the Auto Oil II Communication**

In its Conclusions of 19 December 2000 on the Auto Oil II Communication, the Council supported the Commission's view of the need for further action on ambient levels of particulate matter, nitrogen oxides and tropospheric ozone. Furthermore, the Council invited the Commission to submit proposals rapidly to confirm the fuel

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<sup>1</sup> OJ L 350, 28.12.1998, p.58  
<sup>2</sup> COM(2000) 626 final.

specifications for 2005 in Directive 98/70/EC and to encourage the progressive and harmonised introduction of fuels with the lowest possible sulphur content. The Commission was further invited to make efforts to reduce nano-particle emissions and to commence the technical work regarding the feasibility of additional vehicle emission limit values to come into force in 2010 in line with prevailing fuel specifications. In addition, the Council invited the Commission to consider the ongoing use of Methyl Tertiary Butyl Ether (MTBE) in petrol in light of the risk assessment undertaken within the framework of Existing Substances Regulation 793/93<sup>3</sup>.

### 2.3. CO<sub>2</sub>/cars commitments

The auto manufacturers have made commitments to reduce the average CO<sub>2</sub> emissions of the new car fleet to 140 g CO<sub>2</sub> per kilometre by 2008 (European manufacturers) or 2009 (Japanese and Korean manufacturers). This is major part of the Community's strategy to reduce the fuel consumption and carbon dioxide emissions (CO<sub>2</sub>) from new passenger cars<sup>4</sup>. The auto-manufacturers have indicated that delivery of these objectives will be linked to the introduction of new direct injection diesel and gasoline technologies. Moreover, the manufacturers are aiming for a high share of new car sales (90% in 2008) to be equipped with such technologies. The Commission fully expects the auto-manufacturers to meet their commitments which, in any event, are subject to comprehensive monitoring. This includes the joint monitoring mechanism with the manufacturing associations and the future Community monitoring system<sup>5</sup>.

## 3. THE SULPHUR REVIEW

Some Member States and fuel producers have indicated their intention to introduce zero sulphur fuels<sup>6</sup> to the European market. Indeed, the Commission has proposed, and the Council authorised, that Germany be allowed to incentivise their introduction in 2003<sup>7</sup>. Moreover, more technical information has appeared concerning the performance of new fuel-efficient vehicle technologies such as lean-burn gasoline direct injection. Given these developments the Commission launched a public consultation on May 23<sup>rd</sup> 2000 regarding the level of sulphur in petrol and diesel. Many stakeholders participated and submitted evidence which was synthesised into a summary report by independent consultants and also subjected to independent peer-review<sup>8</sup>. In addition, a refining study was undertaken by Purvin & Gertz<sup>9</sup> to estimate the costs associated with the production of zero sulphur fuels. The responses to the consultation and the various reports are available on the web<sup>10</sup>.

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<sup>3</sup> OJ L 84, 5.4.1993, p.1

<sup>4</sup> COM (1995) 689 final

<sup>5</sup> Decision 1753/2000/EC establishing a scheme to monitor the average specific emissions of CO<sub>2</sub> from new passenger cars, OJ L 202, 10.8.2000, p. 1.

<sup>6</sup> Throughout this document "zero sulphur" fuels refers to levels of sulphur less than 10mg/kg (ppm). Other terms such as "near zero", "low sulphur" or "ultra-low sulphur" may also be used to indicate the same level of sulphur.

<sup>7</sup> COM (2000) 397 final

<sup>8</sup> *Consultation on the Need to Reduce the Sulphur Content of Petrol & Diesel Fuels below 50 ppm: - A Policy Maker's Summary.* George Marsh, Nikolas Hill, Jessica Sully, AEA Technology, November 2000.

<sup>9</sup> "ULS Gasoline and Diesel Refining Study". C.H. Birch & R.Ulivieri, Purvin & Gertz, November 2000.

<sup>10</sup> <http://www.europa.eu.int/comm/environment/sulphur/index.htm>.

### **3.1. Results of the consultation exercise**

Sulphur in fuels can impair the effectiveness of several existing and emerging automotive technologies such as three-way catalytic converters, oxidation catalysts, NO<sub>x</sub> Storage Traps (NSTs) and particulate traps. The way sulphur affects these devices is fully described in the AEA summary of the “Sulphur Review”. The major conclusions of the consultation are summarised below:

#### **Petrol**

EURO IV emission standards for petrol cars can be attained using fuel quality mandated for 2005 (containing a maximum 50 ppm sulphur).

Zero sulphur petrol will lead to an improvement in the fuel economy of post-2005 gasoline direct injection cars by 1–5% compared to similar vehicles using fuel containing a maximum of 50 ppm sulphur.

Zero sulphur petrol will lead to lower emissions of conventional pollutants from the existing fleet of petrol vehicles.

#### **Diesel**

Some new technologies, such as NO<sub>x</sub> storage traps, may not be suitable for certain light duty diesel applications without zero sulphur diesel.

For heavy duty vehicles the review indicated that exhaust after-treatment devices will perform better and be more durable with zero sulphur diesel. In addition, it may not be possible to meet the EURO IV/V emissions standards without zero sulphur diesel.

The fuel economy of other diesel vehicle types and technologies would also improve by using zero sulphur fuels.

The use of zero sulphur diesel by the existing fleet could also lead to lower emissions of pollutants such as particulate matter.

#### **Refinery disbenefits**

An increase in refinery emissions of CO<sub>2</sub> is associated with producing zero sulphur petrol and diesel fuels. Increases of approximately 5% of current emissions or 4.6 Mt CO<sub>2</sub> per annum are expected from 100% production of zero sulphur diesel and petrol across the Community<sup>11</sup>.

## **4. THE INTRODUCTION OF ZERO SULPHUR FUELS**

The introduction of zero sulphur fuels forms a major element of the attached proposal. Many issues have been considered during its preparation including the costs and benefits, changes in greenhouse gas emissions, the requirement for regulatory clarity, logistical and distribution issues, the encouragement of new

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<sup>11</sup> CONCAWE Review volume 9, Number 2, October 2000. Also CONCAWE/EUROPIA’s response to the Commission’s “Call for Evidence” on the levels of sulphur in petrol & diesel fuel.

technology, the variations in vehicle renewal rates and the necessity to ensure the free circulation of new vehicles throughout the Community.

#### **4.1. Content of the proposal**

##### *4.1.1. Date for the introduction of zero sulphur fuels*

The proposal mandates the introduction of zero sulphur petrol and diesel fuels by no later than 1<sup>st</sup> January 2005. This is consistent with the entry into force in 2005 of the new "EURO IV" vehicle emissions limits and the requirement of some new automotive technologies to use zero sulphur fuels in order to attain these limits. The initial quantities of zero sulphur fuels that will be required will vary between Member States according to the levels of new vehicle sales and the proportion of these vehicles equipped with the new fuel-efficient technologies. Nonetheless, it is important that zero sulphur fuels are available in sufficient quantities with a balanced geographic coverage in all Member States in order to permit the free-circulation of those new vehicles requiring zero sulphur fuels. The introduction of zero sulphur fuels in limited quantities should not, however, compromise the capacity of fuel producers to supply fuels in 2005 which comply with the mandated sulphur limit of 50 ppm.

##### *4.1.2. Date for full penetration of zero sulphur fuels*

The optimum saving in greenhouse gas emissions is achieved by phasing the introduction of zero sulphur fuels to match the quantity of fuel actually required by new vehicles. This avoids additional costs and emissions of CO<sub>2</sub> at the refinery. However, optimal reductions in conventional air pollutants are obtained by a full market penetration of zero sulphur fuels as early as possible. An added degree of complexity is that the reductions in conventional air pollutants are apparently greater for existing petrol vehicles than for existing diesel vehicles. Also, the fuel economy improvement of new petrol vehicles appears greater than that of new diesel vehicles.

The magnitude of the costs and additional CO<sub>2</sub> emissions from refineries are uncertain as it is difficult to predict how refinery processing technologies will advance in the future. There are already several promising technologies for petrol desulphurisation which appear to have substantially less impact on CO<sub>2</sub> emissions than has been assumed in the preparation of this proposal. There is also likely to be further optimisation of desulphurisation processes for diesel fuel.

Based upon the analysis of all the costs and benefits the Commission has proposed a full penetration of zero sulphur petrol by 1<sup>st</sup> January 2011. This gives a mix of conventional air quality benefits, fuel cost savings and overall CO<sub>2</sub> emission reductions (as described later).

The smaller air quality benefits and higher refinery costs favour a phased introduction of zero sulphur diesel to satisfy the demand of new vehicle technologies. However, the current distribution infrastructure for diesel is designed for a single grade of product (unlike petrol) and so the supply and distribution of two grades may introduce additional complexity and costs to the operations of fuel producers. This is particularly so where the geographic distribution of refineries is such that individual fuel producers exchange product in order to minimise distribution costs and product movements.

On balance, it appears desirable to also set a deadline of 1<sup>st</sup> January 2011 for the full introduction of zero sulphur diesel. This gives a clear regulatory signal and limits the period where multiple grades of diesel can be marketed. However, this deadline will be reviewed at a later stage. The aim of the review will be to appraise the end date in order to prevent any overall increase in greenhouse gas emissions. The review will consider the refiners' experience in producing zero sulphur diesel (and associated increases in CO<sub>2</sub> emissions), developments in refinery processing technologies and the impacts that these will have on costs and additional refinery emissions of greenhouse gases. Moreover, the review will consider the developments in diesel vehicle technologies, associated fuel requirements and fuel efficiency improvements.

#### 4.1.3. *Vehicle refuelling*

During the phased introduction of zero sulphur fuels it is important that new vehicles use the appropriate fuel as these vehicles will not otherwise derive a fuel economy benefit. This can be achieved by the provision of adequate labelling at the fuel dispenser as is currently the case with the advanced introduction of 50 ppm sulphur fuels. In addition, manufacturers must ensure that purchasers of new vehicles are also given adequate information. Mis-fuelling of new vehicles with a higher sulphur fuel (50 ppm) will not damage these vehicles but neither will it allow the expected fuel economy improvements to be delivered.

#### 4.2. **Repercussions for the CO<sub>2</sub> /cars commitments**

The commitments to reduce the CO<sub>2</sub> emissions from new cars were concluded on the basis of the fuel quality specifications contained in Directive 98/70/EC. However, the manufacturers expressed an expectation that fuels with a maximum sulphur content of 30 ppm would be available across the Community. The current proposal, if adopted, will introduce fuels which are essentially sulphur-free. The impact of these fuels in relation to the attainment of the 140 g CO<sub>2</sub> /km target will, therefore, be taken account of in the joint monitoring mechanism. The availability of zero sulphur fuels resulting from this Directive, will also provide a basis for the Commission to explore with the automobile manufacturers additional commitments aimed at the attainment of the Community's target of 120 g/km for the average CO<sub>2</sub> emissions of the new car fleet when the current environmental commitments with the automobile manufacturers are reviewed in 2003.

### 5. **SPECIFICATION FOR NON-SULPHUR FUEL PARAMETERS IN 2005**

The values for fuel parameters other than the sulphur content of petrol and diesel and the aromatics content of petrol have to be set for the 2005 specification.

#### 5.1. **Effects of fuel quality on emissions**

Exhaust after-treatment devices are very effective in reducing the engine emissions of both regulated and non-regulated pollutants. Their use has increased as vehicle emission standards have become more stringent and this trend is set to continue. This makes the relationship between non-sulphur fuel parameters and the levels of exhaust emissions less apparent. Even for those existing vehicles (not fitted with after-treatment systems) the benefits of reformulated fuels will decrease over time as the fleet turns over and older vehicles are replaced by newer lower emitting versions.

Moreover, most of the reported information on the impact of fuel quality on exhaust emissions relates to EURO II vehicles. By 2005 many of these vehicles will have been replaced by newer models and so it is not clear that the same relationships between fuel quality and emissions will apply. In addition, as the sulphur content of petrol and diesel is further reduced to below 10 ppm the efficiency of catalytic devices will be further enhanced and the relationship between fuel quality and exhaust emissions may change even further.

### 5.1.1. PAH content of diesel fuel

There has been concern over human exposure to Poly Aromatic Hydrocarbons (PAHs) in air. Diesel vehicle exhaust is known to contain PAHs and attention has focussed, therefore, on the levels of PAHs in diesel fuel. The relationship between the PAHs in diesel fuel and in the exhaust gases was not studied in the EPEFE<sup>12</sup> programme. However, a review of the available literature regarding fuel quality and PAH emissions has been published by CONCAWE<sup>13</sup>. Several studies have demonstrated that PAHs are formed during the combustion process (“pyrosynthesis”).

Emissions testing in heavy-duty engines showed that fuels containing low levels of PAHs produced similar emissions of PAHs compared to high PAH containing fuels when other fuel parameters were left unchanged<sup>14</sup>. Other studies<sup>15</sup> comparing a reference diesel fuel (based upon EN 590) and a Swedish Class I diesel fuel have shown apparently larger contributions from fuel-borne PAHs based upon the total mass of PAHs emitted. However, fuel parameters other than the PAH content were also changed significantly. The CONCAWE report also describes the positive impact of after treatment technologies. These can reduce the emissions of PAHs from diesel engines by between 60-80% even with fuels containing 0.05% sulphur.

The Commission intends to bring forward a proposal for legislation setting limits for PAHs in ambient air in 2001. The limit values and time period for their attainment have yet to be decided but these may have implications for those source sectors which emit PAHs to air. Current emissions inventories estimate that road transport will contribute less than 10% of total emissions of PAHs in 2010<sup>16</sup>.

## 5.2. CO<sub>2</sub> emissions at refineries

Changes to the fuel parameters may require additional processing which may result in additional CO<sub>2</sub> emissions at the refinery. These effects have been quantified by Bechtel as part of the Auto-Oil II Programme<sup>17</sup>. For example, a reduction in the content of PAHs requires more severe processing (at higher temperatures and pressures) than that required to reduce the sulphur content to 10 ppm. This could substantially increase refinery CO<sub>2</sub> emissions and reduce the benefits from the introduction of zero sulphur fuels in the short to medium term. The CO<sub>2</sub> emissions

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<sup>12</sup> European Programme on Emissions, Fuels and Engine Technologies compiled by EUROPIA & ACEA.

<sup>13</sup> “Polycyclic Aromatic Hydrocarbons in automotive exhaust emissions and fuels”. Report No. 98/55, CONCAWE 1998.

<sup>14</sup> Doel, R.C. (1996). “Fuel property effects on PAH emissions from modern heavy duty engines”. ImechE No C517/032/96. London, Institute of Mechanical Engineers.

<sup>15</sup> Grägg, K (1995). “Chemical characterization and biological testing of exhaust emissions from a truck fuelled with EC1 and EPEFE reference fuel”. Report No. MTC 9510; & “The effects on the exhaust emissions of changing to a low aromatic, low PAC and low sulphur diesel fuel”. Report No. MTC 9517. Haininge, Sweden: AB Svensk Bilprovning Motortestcenter.

<sup>16</sup> PAH Position Paper, The Working Group on PAHs chaired by Dr Mike Woodfield of AEA Technology.

<sup>17</sup> The Final Report of Working Group 3 as part of the Auto-Oil II Programme. Bechtel November 2000.

penalty associated with producing 10 ppm sulphur diesel has been estimated at 1.5 Mtonnes<sup>18</sup>. According to Bechtel a reduction of the PAH content to a market average of 3% would result in a penalty of 1.1 Mtonnes CO<sub>2</sub>. If the density of diesel is also reduced to 825 kg/m<sup>3</sup> this penalty rises to 3.1 Mtonnes of CO<sub>2</sub>.

### **5.3. Conclusion (non-sulphur fuel quality parameters)**

Given the increased use of catalytic after-treatment systems, it is likely that zero sulphur fuels will have a greater impact on vehicle emissions than changes to the non-sulphur fuel parameters. The Commission has not, therefore, proposed any changes to the non-sulphur fuel parameters currently stated in Annexes I & II of Directive 98/70/EC. However, the aromatics content of petrol (35% v/v) and the maximum sulphur content of petrol (50 ppm) and diesel (50 ppm) shall take the values already stipulated in Annexes III and IV of Directive 98/70/EC. Naturally, the limits for these non-sulphur parameters will be kept under review within the framework of the Community's policies on air quality and in the development of stricter emissions limits for light and heavy duty vehicles.

## **6. MTBE (METHYL TERTIARY BUTYL ETHER)**

### **6.1. Background and use of MTBE**

MTBE is a chemical containing oxygen that is blended into petrol primarily to boost the octane rating. This allows other high-octane gasoline components such as benzene and aromatics to be substituted. However, MTBE is readily soluble in water and has a pungent odour and taste that can render water undrinkable at concentrations that do not pose any risk to human health. Leakage of petrol from underground storage tanks or spillage at service stations can lead to the contamination of ground water as the MTBE permeates through the soil. Such contamination has been observed in the USA where steps are being taken to phase out its use. In the US, the use of a minimum amount of MTBE in gasoline has been mandated for several years. Consumption in Europe has been lower as the use of MTBE in petrol is not mandated but permitted subject to a maximum content. However, consumption may increase as refiners adjust to the new aromatics specification of petrol that enters into force from 1<sup>st</sup> January 2005.

### **6.2. Risk Assessment under the existing substances Regulation**

The risks of MTBE to man and the environment have been assessed under Council Regulation (EEC) 793/93<sup>19</sup>. As a preliminary conclusion, the risk assessment identified a need for specific measures to limit the risks in relation to the aesthetic quality of ground water. The Commission shall now submit to the Regulatory Committee referred to in Article 15 of Regulation 793/93 a proposal concerning the results of the risk evaluation and a recommendation for an appropriate strategy to limit those risks. The Commission Recommendation on MTBE will in principle be adopted in 2001 and published in the Official Journal.

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<sup>18</sup> *CONCAWE Review* volume 9, Number 2, October 2000. Also CONCAWE/EUROPIA's response to the Commission's "Call for Evidence" on the levels of sulphur in petrol & diesel fuel at: <http://www.europa.eu.int/comm/environment/sulphur/index.htm>

<sup>19</sup> Regulation N° 793/93/EEC, OJ L 84, 5.4.1993, p.1



### 6.3. Community legislation on groundwater protection

There are two main pieces of Community legislation aimed at protecting the quality of groundwater. The first is Directive 80/68/EEC<sup>20</sup> on the protection of groundwater and the second is the recently adopted water quality framework Directive 2000/60/EC<sup>21</sup> which will ultimately replace the former. Articles 3 and 5 of Directive 80/68/EEC oblige the Member States to take the necessary steps to prevent the introduction into groundwater of “List I” substances such as mineral oils and hydrocarbons. In addition, Member States are obliged to limit the introduction of “List II” substances such as those which have a deleterious effect on the taste and odour of groundwater. The water framework Directive is based upon the same principle of prevention but is more comprehensive. The Member States are obliged to:

- (i) implement the necessary measures to prevent or limit the input of pollutants into groundwater and prevent the deterioration of groundwater status;
- (ii) protect, enhance and restore all bodies of groundwater with the aim of achieving good groundwater status within 15 years and,
- (iii) implement the necessary measures to reverse any significant and sustained upward trend in groundwater pollution arising from human activity.

Furthermore, for each river basin district the Member States will have to review the impact of human activity on the groundwater status and establish groundwater monitoring programmes.

### 6.4. Content of proposal regarding MTBE

Although MTBE has been found in groundwater in certain Member States, the Commission is not of the opinion that such contamination is widespread across the Community. Moreover, a recent study conducted by AD Little<sup>22</sup> confirmed that such contamination is unlikely if standards governing the construction and operation of underground storage tanks at service stations are robustly enforced.

In addition, Directive 98/70/EC is a harmonising Directive, based upon Article 95 of the Treaty, which aims to ensure the correct functioning of the internal market. Moreover, the Directive prevents Member States from restricting the sale of petrol or diesel which comply with the specifications that the Directive contains. On balance, therefore, the Commission considers that measures intended to protect groundwater from contamination by MTBE are best considered within the water framework Directive.

Accordingly, the Commission has not proposed any amendment to Directive 98/70/EC in respect of the MTBE content of petrol. This does not, however, affect the prerogative of Member States to request stricter environmental specifications according to the provisions of Articles 95(5) and 95(6) of the Treaty. The Commission fully expects that those marketing petrol and diesel will recognise their

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<sup>20</sup> OJ L20, 26.1.1980, p. 43

<sup>21</sup> OJ L 327, 22.12.2000, p. 1

<sup>22</sup> J. Barker, A. Marples, “*MTBE and the Requirements for Underground Storage Tank Construction and Operation in Member States*”, A report to the European Commission prepared by A.D. Little, March 2001.

obligations and potential liability for MTBE contamination of groundwater and take appropriate preventive measures. The Commission will of course keep this issue under review in light of additional water quality monitoring and groundwater assessments undertaken within the context of the water framework Directive and propose any measures as may be appropriate.

## **7. FUELS FOR NON-ROAD MOBILE MACHINERY**

The exhaust emissions from engines installed in non-road mobile machinery and agricultural tractors are regulated by Directive 97/68/EC<sup>23</sup> and Directive 74/150/EEC<sup>24</sup> respectively. Heating oil has been widely used by these vehicles in the past. The maximum permissible sulphur content of heating oil (gas oil) was originally contained in Directive 93/12/EC<sup>25</sup>, which was subsequently amended by Directive 1999/32/EC<sup>26</sup>. Fuels used by non-road mobile machinery were originally included in Directive 93/12/EC but explicitly excluded from Directive 1999/32/EC. The wording of Article 2 of Directive 98/70/EC can be interpreted so as to permit (but not mandate) alternatives for the maximum sulphur content of fuels used by non-road mobile machinery and agricultural tractors. This can be either the sulphur content of diesel fuels stated in Directive 98/70/EC or the previous sulphur content of diesel fuel stated in Directive 93/12/EC. As Directive 93/12/EC has largely been repealed there is in fact further uncertainty regarding the meaning of this reference.

In summary, there is uncertainty regarding the permissible sulphur content of fuels used by non-road mobile machinery and agricultural tractors. The current proposal seeks to clarify the intent of previous provisions. No new provisions are proposed. Hence, the proposal defines an absolute maximum sulphur content of 0.2% (<sup>m</sup>/<sub>m</sub>) reducing to 0.1% (<sup>m</sup>/<sub>m</sub>) in 2008 (in line with the provisions on heating oil). In addition, Member States may use alternative maxima of 500 ppm or the sulphur limits for diesel fuels contained in Directive 98/70/EC. In the longer term a further reduction of the sulphur content of non-road fuels may be required to allow the attainment of more stringent engine emissions standards which may be developed within the context of Directive 97/68/EC. The Commission is currently looking at this issue.

## **8. EMERGING ISSUES & FUTURE REVIEW**

In addition, to the review of the deadline for the full introduction of zero sulphur diesel, several other emerging issues may also have implications for fuel quality standards. In its conclusions on the Commission's Communication on the Auto-oil II Programme the Council raised concerns over vehicular emissions of particulate matter and in particular the effects on health of nano-sized particles. Moreover, the Council asked the Commission to commence the technical work to underpin a further set of vehicle emission standards for introduction in 2010.

In parallel the Commission is undertaking a review of the technical feasibility of the Euro IV/IV+ emissions standards for heavy-duty engines and is preparing for a

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<sup>23</sup> OJ L 59, 27.2.1998, p.1  
<sup>24</sup> OJ L 84, 28.3.1974, p.10  
<sup>25</sup> OJ L 74, 27.3.1993, p. 81  
<sup>26</sup> OJ L 121, 11.5.1999, p.13

review of the Directives setting Community air quality objectives. In addition, the Commission will also bring forward a proposal in 2001 for legislation setting air quality limit values for Poly-Aromatic Hydrocarbons in ambient air. Finally, it is expected that the use of renewable fuels will grow in response to the challenge of climate change. All of these may have implications for fuel quality standards which should, therefore, be kept under review. The Commission plans to complete such a review no later than 31<sup>st</sup> December 2006.

## **9. COSTS & BENEFITS OF THE COMMISSION'S PROPOSAL**

As no changes are proposed to the non-sulphur fuel parameters the analysis of costs and benefits necessarily focuses on the introduction of zero sulphur petrol and diesel fuels. The analysis estimated the additional costs of refining zero sulphur fuels and the value of the potential fuel cost savings and air quality improvements. These arise from the improved fuel economy of EURO IV vehicles and the reduced levels of pollution emitted by the existing fleet of vehicles. No attempt was made to monetise the benefits of reduced emissions of carbon dioxide nor to estimate potential reductions in emissions of other greenhouse gases such as nitrous oxide.

### **9.1. Costs of introducing zero sulphur fuels**

The costs of lowering the sulphur content from 50 ppm to around 10 ppm are the additional investment and operational costs at refineries. Several Member States and the European Petroleum Industry Associations (EUROPIA/ CONCAWE) have provided costs associated with the production of zero sulphur fuels. These are described in the Summary report from the Sulphur Review. EUROPIA estimated Net Present Value costs of €11.5 billion using a discount rate of 7% and a plant life of 15 years. This equates to €cents 0.35 per litre for 10 ppm sulphur petrol and €cents 0.56 per litre for 10 ppm sulphur diesel based upon 1995 consumption figures. These costs are very similar to other estimates submitted to the Sulphur Review which ranged from €cents 0-0.35 per litre for zero sulphur petrol and €cents 0.18-0.67 per litre for zero sulphur diesel.

DG Environment commissioned an independent report from consultants Purvin & Gertz on the costs to refiners of producing zero sulphur fuels. This independent estimate is based upon an analysis of the investment requirements and operational changes required to move from a 50 ppm sulphur petrol and diesel baseline which is already mandated in Directive 98/70/EC. The Table below indicates the range of costs that they identified. These are similar to those estimates submitted to the Sulphur Review. The main driver of cost difference between North and South EU is the quality of the crude oil (in particular the sulphur content) that the refineries are currently configured to process. This analysis may be overly conservative as information from fuel companies shows that the fuel mix is progressively converging.

### Additional costs of refining (€cents per litre) used in this analysis

	Petrol (min)	Petrol (max)	Petrol (ave)	Diesel (min)	Diesel (max)	Diesel (ave.)
EU, North <sup>27</sup>	0.1	0.3	0.2	0.3	0.6	0.45
EU, South	0.2	0.3	0.25	0.6	0.9	0.65

The analysis from Purvin & Gertz is based upon “yardstick” catalytic cracking refineries which represent approximately 75% of refining capacity in Europe. These yardstick refineries aim to represent competitive refining capacity in the North and Southern EU regions in terms of refinery yields and operating costs. Costs are expected to be highest for these catalytic cracking refineries rather than, for example, hydrocracking refinery configurations which are already capable of producing very low sulphur petrol and diesel fuels. In addition, the Purvin & Gertz study assumed a complete switch to zero sulphur fuel production in 2008. If a phased introduction is implemented then investment costs are likely to be lower. This is because new technologies currently under development are likely to make further progress towards market utilisation. Furthermore, refiners can, at least initially, selectively desulphurise some fuel components whilst leaving others unchanged for blending into 50 ppm sulphur fuels.

Additional costs associated with the distribution of zero sulphur fuels have not been addressed. These may be more significant for diesel than for petrol where historically several grades have been marketed in parallel. The impact for diesel will be different in different countries according to the method of distribution (pipeline, road etc.) and the exchange agreements between different fuel producers. These costs are therefore difficult to estimate. The UK Petroleum Industries Association has reported that distribution by pipeline could result in more contaminated interface material which would require reprocessing. This could increase costs by an equivalent of 0.07 €cents per litre. In terms of forecourt dispensing facilities there should be few costs for distributing zero sulphur petrol. However, for diesel UK PIA has indicated that additional dispensers would cost in the region of €16k per service station. It is, however, unlikely that every service station would market all grades of fuel simultaneously but would switch progressively as the rate of penetration of zero sulphur diesel increased.

In the summary presented below, costs are presented for the EU. These have been calculated according to the amount of zero sulphur petrol and diesel produced multiplied by the average price premium estimated by Purvin & Gertz.

## 9.2. Benefits of introducing zero sulphur fuels

The overall benefits of the proposal are derived from the sum of the reduced fuel costs for the consumer, reduced emissions of conventional air pollutants and the additional refinery costs associated with producing the required amounts of zero sulphur fuels. Benefits from reduced emissions of CO<sub>2</sub> have not been monetized. It has been estimated that the use of zero sulphur fuel would decrease the fuel

<sup>27</sup>

“EU North” includes Austria\*, Belgium\*, Denmark\*, Finland, Germany, Ireland, Luxembourg\*, the Netherlands, Sweden\* and the UK. “EU South” includes Greece, Italy, Portugal\* and Spain. Note: For the purposes of this analysis, France was considered 50% North and 50% South. The Member States with an asterisk are not analysed as they are not included in the TREMOVE model. Note that in Finland and Sweden 10 ppm diesel fuel is already the norm.

consumption of EURO IV petrol vehicles by an average of 3% and around 2% for diesel vehicles. Fuel consumption of pre EURO IV vehicles is assumed to be unaffected and that emissions of conventional pollutants from new EURO IV vehicles are also unaffected (“*The Homologation Effect*”). However, there may be a further tightening of vehicle emission standards in 2010 which will take account of the availability of zero sulphur fuels. These potential benefits have not been estimated.

Pollutant emissions from existing petrol vehicles have been assumed to reduce by 10% when using petrol containing 10 ppm of sulphur. The corresponding reduction in the emissions of particulate matter from existing diesel vehicles has been estimated at 5%. All of these estimates are relative to vehicles using fuels containing a maximum of 50 ppm of sulphur. The refinery costs of producing a given quantity of fuel are calculated on a pro-rata basis from the costs of producing 100% zero sulphur fuels.

### Summary of Costs, benefits and emissions reductions

	2007	2012	2020
<b>CO<sub>2</sub> emissions changes</b>			
Change in CO <sub>2</sub> emissions in refineries, (kT)	407.0	5,348.3	5,404.3
CO <sub>2</sub> change from cars (3% petrol 2% diesel), (kT)	-1,245.9	-6,850.0	-13,574.9
<b>Net change in CO<sub>2</sub> emissions (kT)</b>	<b>-838.9</b>	<b>-1,501.7</b>	<b>-8,170.6</b>
<b>Costs and Benefits, € million</b>			
Increase in refining costs (average per year)	-75.4	-995.0	-1,019.0
Savings due to lower fuel consumption (average)	120.5	661.6	1,309.1
Benefits from better air quality	0.0	304.1	18.3
<b>Net benefits (- depicts net costs)</b>	<b>45.2</b>	<b>-29.3</b>	<b>308.4</b>
<b>Net Present Value (4%), €million</b>	<b>1,061.2</b>		
<b>Changes in air related emissions</b>			
NOx, kilotonnes	0	-39.0	-2.5
VOC, kilotonnes	0	-14.4	-0.9
CO, kilotonnes	0	-176.8	-9.9
PM, tonnes	0	-366.7	-11.8

*Note. All costs are without VAT or excise duties. For emissions negative signs indicate reductions, for benefits negatives signs indicate net costs. The above analysis has assumed a phased introduction of zero sulphur fuels in 2007. The earlier introduction in 2005 is expected to increase the benefits slightly*

The reductions in conventional pollutants have a direct benefit on human health and the environment. These benefits can be converted into monetary form by attaching a simple benefit per tonne to each tonne of pollutant reduced based on estimates produced under the DG RTD EXTERNE programme. The national implementation reports for EXTERNE<sup>28</sup> provide figures by Member State for damage costs per tonne of pollutant emitted for NOx and particulate matter. The costs and benefits are summarised in the table above. The net present value of the benefits over the period 2005 to 2020 using a 4% discount rate is approximately €1.1 billion.

<sup>28</sup>

See <http://externe.jrc.es>

### 9.3. Net emissions of CO<sub>2</sub>

There are net reductions in the emissions of CO<sub>2</sub> both during the Kyoto accounting period and over the whole period 2008-2020 as depicted in the table below. The additional CO<sub>2</sub> emissions from European refineries have been calculated as a proportion of total additional refinery CO<sub>2</sub> emissions associated with a complete switch to zero sulphur fuel production estimated by CONCAWE/EUROPIA as approximately 5 Mt of CO<sub>2</sub>. These increases are smaller than the reductions in emissions from the new vehicle fleet.

**Summary of CO<sub>2</sub> emission changes (based on EU-9)**

CO <sub>2</sub> Emissions reduction 2008-12		CO <sub>2</sub> Emissions reduction 2013-20	
Total (Mt)	Per annum (Mt)	Total (Mt)	Per annum (Mt)
9.3	1.8	44.5	5.6

*Note. The above analysis has assumed a phased introduction of zero sulphur fuels in 2007. The earlier introduction in 2005 is expected to increase the emissions benefits slightly*

## 10. CONTENT OF THE PROPOSAL

### 10.1. Article 1

This Article details each of the proposed amendments to Directive 98/70/EC.

- (1) This Article introduces a definition into Directive 98/70/EC for those fuels (diesel and gas oils) which are used in non-road mobile machinery and agricultural tractors.
- (2) Article 3 of Directive 98/70/EC is amended so as to mandate the introduction and availability of zero sulphur petrol (less than 10 ppm) in each Member State by no later than 1<sup>st</sup> January 2005. By 1<sup>st</sup> January 2011 all petrol sold must comply with a maximum sulphur content of 10 mg/kg (ppm).
- (3) Article 4 of Directive 98/70/EC is modified so as to mandate the introduction and availability of zero sulphur diesel (less than 10 ppm) in each Member State by no later than 1<sup>st</sup> January 2005. By 1<sup>st</sup> January 2011 all diesel fuel sold must comply with a maximum sulphur content of 10 mg/kg (ppm). This end date will be subject of a review to be performed by 31<sup>st</sup> December 2006. In addition, this Article is modified so as to consolidate the various provisions relating to the sulphur content of gas oils used by non-road mobile machinery and agricultural tractors.
- (4) Article 8 of Directive 98/70/EC is amended so as to place an obligation on the Member States to implement a fuel quality monitoring system and to report fuel quality monitoring data in line with the provisions of a new CEN standard currently being developed. Member States are permitted to use alternative fuel quality monitoring systems so long as they produce results of comparable certainty.
- (5) Article 9 of Directive 98/70/EC is updated and obliges the Commission to complete a review of the fuel specifications by 31 December 2006. This includes an obligation to review the end date whereby all diesel sold must be

zero sulphur in order to ensure that there is no overall increase in greenhouse gas emissions.

- (6) A new Article 9a is added to Directive 98/70/EC which obliges the Member States to establish a system of penalties and fines applicable to breaches of national provisions.
- (7) Article 10 of Directive 98/70/EC is modified so as to simplify the adaptation to technical progress of the measurement methods used to demonstrate compliance with the fuel specifications. The proposed text makes direct reference to the methods stated in the relevant CEN Normes (EN 590 and EN 228) rather than stating them explicitly in the Directive. However, there are safeguards such that a change to a test method proposed by CEN is only binding on the Member States if the change results in a more accurate and more precise method. In parallel, it is intended that EN 228 and EN590 will also be amended so that changes to measurement methods will only be adopted if the change results in a more accurate and more precise method. The Comitology procedure in the Directive is however, maintained for use in exceptional circumstances though the provisions of Article 11 of Directive 98/70/EC have been amended to take account of Council Decision 1999/468/EC<sup>29</sup> of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission.
- (8) The Annexes I to IV of Directive 98/70/EC are replaced by new annexes in this proposal.

#### **10.2. Article 2**

This Article concerns the obligations on the Member States to transpose this proposed Directive.

#### **10.3. Article 3**

Article 3 concerns the date of entry into force of the current Directive.

#### **10.4. Article 4**

Article 4 addresses the proposed Directive to the Member States.

#### **10.5. Annex I**

This contains the specification for unleaded petrol which entered into force on 1<sup>st</sup> January 2000. The explicit listing of the test methods has been replaced by a reference to the methods specified in EN 228. The summer period and the vapour pressure applying during the summer period have been clarified in line with EN 228.

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<sup>29</sup> OJ L 184, 17.7.1999, p.1.

## **10.6. Annex II**

This contains the specification for diesel which entered into force on 1<sup>st</sup> January 2000. The explicit listing of the test methods has been replaced by a reference to the methods specified in EN 590.

## **10.7. Annex III**

This contains the specification for unleaded petrol which enters into force on 1<sup>st</sup> January 2005. The values apart from sulphur and aromatics content are unchanged from those introduced from 1<sup>st</sup> January 2000 (Annex I). The explicit listing of the test methods has been replaced by a reference to the methods specified in EN 228. The summer period and the vapour pressure applying during the summer period have been clarified in line with EN 228. The exceptions for regular unleaded petrol have been removed as this product constitutes such a small proportion of the Community market for petrol.

## **10.8. Annex IV**

This contains the specification for diesel which enters into force on 1<sup>st</sup> January 2005. The fuel parameters are unchanged from those in Annex II (except for sulphur which has already been decided). The explicit listing of the test methods has been replaced by a reference to the methods specified in EN 590.

## **11. VIEWS OF MEMBER STATES AND STAKEHOLDERS**

During the preparation of the current proposal the Commission launched a public consultation on the need to reduce the sulphur content of petrol and diesel. All stakeholders were contacted and views were received from associations representing the Petroleum industry, the vehicle manufacturing industry, vehicle emission control equipment and engine manufacturers. In addition, information was received from individual companies and from several Member States. Furthermore, two meetings have been held to discuss this proposal with Member States and stakeholders whose views are summarised below.

**ACEA** (Association des Constructeurs Européens d' Automobiles)

The European automobile manufacturers (ACEA) supported an introduction of zero sulphur fuels in 2005 in order to coincide with the introduction of new emissions limits for all vehicle types (EURO IV). ACEA has stated that new type-approval emissions limits for heavy duty vehicles and some light duty diesel vehicles might not be attained without zero sulphur diesel. ACEA also wishes to see the non-sulphur fuel parameters modified to reflect the specifications in the World Wide Fuel Charter.

**EUROPIA/CONCAWE** (European Petroleum Industries Association & Oil Companies' Health, Safety and Environment Organisation).

The oil industry associations expressed reservations regarding the uncertainty of the benefits in using zero sulphur fuels, but accepted that in principle the phased introduction was the right approach. In relation to the other fuel parameters EUROPIA/CONCAWE concluded that the environmental justification for modifying



the current values was weak as demonstrated by the Auto-Oil II programme. In addition, CONCAWE has indicated that MTBE is a useful compound that gives refiners added flexibility when meeting the required environmental specifications.

**AECC** (Association of Emission Control Catalysts).

The AECC also supported the introduction of zero sulphur fuels in 2005 followed by a full introduction in 2007.

**European Federation for Transport & Environment (T & E)**

T & E supported the phase-in of zero sulphur fuels in 2005 but preferred an earlier date when all fuel sold would be zero sulphur (2007/8).

**Member States**

There is a clear majority of Member States in favour of the phased introduction of zero sulphur fuels. Only a limited number of Member States expressed a desire for changes to the other fuel quality parameters, primarily those for diesel fuel. Denmark has expressed particular concern over the use of MTBE in petrol but most other Member States do not see its continued use as posing a significant risk for the contamination of groundwater.

Proposal for a

**DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**

**on the quality of petrol and diesel fuels and amending Directive 98/70/EC**

**(Text with EEA relevance)**

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 95 thereof,

Having regard to the proposal from the Commission<sup>1</sup>,

Having regard to the opinion of the Economic and Social Committee<sup>2</sup>,

Having regard to the opinion of the Committee of the Regions<sup>3</sup>,

Acting in accordance with the procedure laid down in Article 251 of the Treaty<sup>4</sup>,

Whereas:

- (1) 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 Council Directive 93/12/EC<sup>5</sup>, lays down the environmental specifications for market fuels;
- (2) Article 95 of the Treaty foresees that Commission proposals aimed at the establishment and functioning of the internal market and concerning, inter alia, health and environmental protection, shall take as a base a high level of environmental protection;
- (3) A revision of Directive 98/70/EC is foreseen in respect of the requirements of Community air quality standards and related objectives and in order to incorporate additional specifications to complement those mandatory specifications already laid down in Annex III and Annex IV of the Directive;
- (4) A reduction of the sulphur content of petrol and diesel has been identified as a means of contributing to the achievement of those objectives;

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<sup>1</sup> OJ C , , p. .

<sup>2</sup> OJ C , , p. .

<sup>3</sup> OJ C , , p. .

<sup>4</sup> OJ C , , p. .

<sup>5</sup> OJ L 350, 28.12.1998, p. 58, as last amended by Commission Directive 2000/71/EC, L 287, 14.11.2000, p. 46.

- (5) The adverse effect of sulphur in petrol and diesel on the effectiveness of catalytic exhaust gas after-treatment technologies is well established;
- (6) Road vehicles are increasingly reliant upon catalytic after-treatment devices to attain the emissions limits mandated in Council Directive 70/220/EEC<sup>6</sup> relating to measures to be taken against air pollution by gases from positive-ignition engines of motor vehicles and Council Directive 88/77/EEC<sup>7</sup> relating to the measures to be taken against the emission of gaseous pollutants from diesel engines for use in vehicles. Accordingly a reduction in the sulphur content of petrol and diesel is likely to have a larger impact on exhaust emissions than changes to the other fuel parameters;
- (7) The introduction of lower sulphur fuels will improve the fuel efficiency of new, emerging vehicle technologies and lead to significant reductions in emissions of conventional air pollutants when used in existing vehicles. These benefits must be balanced against the increased emissions of CO<sub>2</sub> associated with the production of zero sulphur petrol and diesel;
- (8) It is therefore appropriate to lay down measures ensuring the introduction and availability of zero sulphur fuels. In this regard fiscal incentives have been shown to be effective in promoting the introduction of higher quality fuels according to national needs and priorities;
- (9) The availability of zero sulphur fuels resulting from this Directive, will provide a basis for the automobile manufacturers to make significant additional commitments towards the attainment of the Community's target of 120 g/km for the average CO<sub>2</sub> emissions of the new car fleet when the current environmental commitments with the automobile manufacturers are reviewed in 2003;
- (10) It is necessary to ensure that sufficient quantities of zero sulphur petrol and diesel fuels are available from 1 January 2005 on a balanced geographic basis in order to permit the free circulation of new vehicles requiring these fuels whilst ensuring that CO<sub>2</sub> emissions reductions from new vehicles outweigh those additional emissions associated with the production of zero sulphur fuels;
- (11) The complete penetration of zero sulphur fuels should be provided for from 1 January 2011 in order to allow the fuel manufacturing industry enough time to make the necessary investments to adapt its production plans. In addition, the full introduction of zero sulphur fuels from 2011 will reduce emissions of conventional pollutants from the existing fleet of vehicles leading to an improvement in air quality whilst ensuring that there is no overall increase in greenhouse gas emissions;
- (12) The emissions from engines installed in non-road mobile machinery and agricultural tractors must comply with the limits stipulated in Directive 97/68/EC of the European Parliament and of the Council<sup>8</sup> relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road

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<sup>6</sup> OJ L 76, 6.4.1970, p. 1. Directive as last amended by Directive 2001/1/EC of the European Parliament and of the Council (OJ L 35, 6.2.2001, p.34).

<sup>7</sup> OJ L 36, 9.2.1988, p. 33. Directive as last amended by Directive 1999/96/EC of the European Parliament and of the Council (OJ L 44, 16.2.2000, p.1).

<sup>8</sup> OJ L 59, 27.2.1998, p. 1.

mobile machinery and of Council Directive 74/150/EEC<sup>9</sup> relating to the type-approval of wheeled agricultural or forestry tractors, respectively. Attainment of these emissions limits will become increasingly dependent upon the quality of the gas oils used by these engines and so it is important to include a definition for such fuels in Directive 98/70/EC;

- (13) It is appropriate to provide for a uniform system of fuel quality monitoring and reporting in order to assess compliance with the mandated environmental fuel quality specifications;
- (14) A procedure should be laid down for updating the measurement methods used to ensure compliance with the mandated fuel quality specifications;
- (15) The provisions of Directive 98/70/EC should be amended to take account of Council Decision 1999/468/EC of 28 June 1999 laying down procedures for the exercise of implementing powers conferred upon the Commission<sup>10</sup>;
- (16) Provision should be made for a review of the provisions in Directive 98/70/EC in order to take account of new Community air quality legislation and related environmental objectives, the development of new pollution abatement technologies and to confirm, or otherwise, the date for full introduction of zero sulphur diesel in order to ensure that there is no overall increase in emissions of greenhouse gases;
- (17) The Member States should lay down rules on penalties applicable to infringements of the provisions of Directive 98/70/EC and ensure that they are implemented. Those penalties must be effective, proportionate and dissuasive;
- (18) Directive 98/70/EC should therefore be amended accordingly,

HAVE ADOPTED THIS DIRECTIVE:

### *Article 1*

Directive 98/70/EC is amended as follows:

1. Article 2 is amended as follows:
  - (a) The second paragraph of point 2 is deleted.
  - (b) The following point 3 is added.
- “3. ‘gas oils intended for use by non-road mobile machinery and agricultural tractors’ means:

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<sup>9</sup> OJ L 84, 28.3.1974, p. 10. Directive as last amended by Directive 2000/25/EC of the European Parliament and of the Council (OJ L 173, 12.7.2000, p.1).

<sup>10</sup> OJ L 184, 17.7.1999, p. 1.

- any petroleum derived liquid, falling within CN codes 2710 00 66 to 2710 00 68, intended for use in engines referred to in Directives 97/68/EC and 74/150/EC as amended respectively, and where
- less than 65% by volume (including losses) distils at 250°C by the ASTM D 86 method (or where distillation percentage cannot be determined by the ASTM D 86 method), and where
- 85% or more by volume (including losses) distils at 350°C by the ASTM D 86 method.”

2. Article 3 is amended as follows:

(a) The following sub-paragraphs (d) and (e) are added to paragraph 2.

“(d) Without prejudice to the provisions of subparagraph (c), Member States shall take all necessary measures to ensure that, by no later than 1<sup>st</sup> January 2005, unleaded petrol with a maximum sulphur content of 10 mg/kg (ppm) is marketed in their territories. Member States shall ensure that such unleaded petrol is available on a balanced geographic basis and complies in all other respects with the specifications in Annex III.

(e) By no later than 1 January 2011, Member States shall ensure that unleaded petrol can be marketed in their territory only if it complies with the environmental specification set out in Annex III except for the sulphur content which shall be less than 10 mg/kg (ppm).”

3. Article 4 is amended as follows:

(a) The following sub-paragraphs (d) and (e) are added to paragraph 1.

“(d) Without prejudice to the provisions of subparagraph (c), Member States shall take all necessary measures to ensure that, by no later than 1<sup>st</sup> January 2005, diesel fuel with a maximum sulphur content of 10 mg/kg (ppm) is marketed in their territories. Member States shall ensure that such diesel fuel is available on a balanced geographic basis and complies in all other respects with the specifications in Annex IV.

(e) By no later than 1 January 2011, Member States shall ensure, subject to the provisions of Article 9.1(a), that diesel fuel can be marketed in their territory only if it complies with the environmental specification set out in Annex IV except for the sulphur content which shall be less than 10 mg/kg (ppm).”

(b) The following new paragraph 5 is added.

“5. Member States shall ensure that gas oils marketed in their territory and intended for use by non-road mobile machinery and agricultural tractors contain less than 2000 mg/kg (ppm) of sulphur. By 1 January 2008 at the latest the maximum permissible sulphur content of gas oils intended for use by non-road mobile machinery and

agricultural tractors shall be 1000 mg/kg (ppm). However, Member States may require a lower limit of 500 mg/kg (ppm) or the same sulphur content as for diesel fuels as stipulated in this Directive.”

4. Article 8 is replaced by the following.

“Article 8

- “1. Member States shall monitor compliance with the requirements of Articles 3 and 4, in respect of petrol and diesel fuels, on the basis of the analytical methods referred to in European Normes EN 228 and EN590 respectively.
2. The Member States shall establish a fuel quality monitoring system which must comply, as a minimum, with the requirements of EN xxxxxx (*number of new standard to be inserted once published*). The use of an alternative fuel quality monitoring system may be permitted so long as Member States are able to demonstrate that such a system provides results of comparable quality.
3. Each year by 30 June the Member States shall submit a summary of national fuel quality data for the preceding calendar year. The first summary shall be submitted by 30 June 2002. The format for this summary shall follow that described in EN xxxxxx xxxxxx (*number of new standard to be inserted once published*). In addition, Member States shall report the total volumes of petrol and diesel fuel marketed in their territories and the volumes of unleaded petrol and diesel marketed which contain less than 10 mg/kg (ppm) of sulphur. Furthermore, the Member States shall report the extent geographically to which petrol and diesel fuels containing less than 10 mg/kg (ppm) of sulphur are marketed within their territory.”

5. Article 9 is amended as follows:

- (a) Paragraph 1 is replaced by the following.

- “1. By 31 December 2006 at the latest the Commission shall review the fuel specifications of Directive 98/70/EC and propose amendments, if appropriate, in keeping with current and future requirements of Community air quality legislation and related objectives. In particular, the Commission shall consider:
- (a) The necessity of any change to the end date for the full introduction of diesel fuel, with a maximum sulphur content of 10 mg/kg (ppm), in order to ensure that there is no overall increase in greenhouse gas emissions. This analysis shall consider developments in refinery processing technologies, expected fuel economy improvements of vehicles and the rate that new fuel-efficient technologies are introduced into the vehicle fleet.
- (b) The implications of new Community legislation setting air quality standards for substances such as Polycyclic Aromatic Hydrocarbons.

- (c) The outcome of the review described in Article 10 of Directive 99/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide, oxides of nitrogen, particulate matter and lead in ambient air\*.
- (d) The outcome of the review of the various commitments with the Japanese\*\*, Korean\*\*\* and European\*\*\*\* automobile manufacturers to reduce the fuel consumption and carbon dioxide emissions of new passenger cars.
- (e) The outcome of the review required by Article 7 of Directive 99/96/EC and the confirmation of the mandatory NOx emission standard for heavy duty engines.
- (f) The effective functioning of new pollution abatement technologies and developments affecting international fuel markets.

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\* OJ L 163, 29.6.1999, p. 41.\*\* OJ L 100, 20.4.2000, p. 57.

\*\*\* OJ L 100, 20.4.2000, p. 55.

\*\*\*\* OJ L 40, 13.2.1999, p. 49."

- (b) Paragraph 2 is deleted.

6. The following Article 9a is inserted:

*“Article 9a*

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.”

7. In Article 10 the first paragraph is replaced by the following:

“The measurement methods referred to in Annexes I, II, III and IV of this Directive shall be those analytical methods set out in European Normes EN 228 and EN 590. Any change to a test method in either EN 228 or EN 590 shall only be binding on the Member States if the new method gives at least the same accuracy and at least the same level of precision as the test method it replaces. In the event that additional adaptation of these methods to technical progress is necessary, amendments may be adopted by the Commission in accordance with the procedure mentioned in Article 11, paragraph 2.”

8. Article 11 is replaced by the following:

*“Article 11*

1. The Commission shall be assisted by the Committee established in accordance with Article 12 of Directive 96/62/EC\*, composed of representatives of the Member States and chaired by a representative of the Commission.
2. Where reference is made to this paragraph, the regulatory procedure laid down in Article 5 of Decision 1999/468/EC shall apply in accordance with Articles 7 and 8 thereof.
3. The period provided for in Article 5 of Decision 1999/468/EC shall be three months.

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\*OJ L 296, 21.11.1996, p.55.”

9. The Annexes I to IV are replaced by the text in the Annex to this Directive.

*Article 2*

Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with this Directive by 30 June 2003 at the latest. They shall forthwith inform the Commission thereof.

Member States shall apply these measures from 1 January 2004.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

*Article 3*

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Communities*.



*Article 4*

This Directive is addressed to the Member States.

Done at Brussels,

*For the European Parliament*  
*The President*

*For the Council*  
*The President*

## “ANNEX

### ANNEX I

#### ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES EQUIPPED WITH POSITIVE-IGNITION ENGINES

Type: *Petrol*

Parameter <sup>1</sup>	Unit	Limits <sup>2</sup>	
		Minimum	Maximum
Research octane number		95 <sup>3</sup>	-
Motor octane number		85	-
Vapour pressure, summer period <sup>4</sup>	kPa	-	60.0 <sup>5</sup>
Distillation:			-
- percentage evaporated at 100 °C	% v/v	46.0	
- percentage evaporated at 150 °C	% v/v	75.0	-
Hydrocarbon analysis:			
- olefins	% v/v	-	18.0 <sup>6</sup>
- aromatics	% v/v	-	42.0
- benzene	% v/v	-	1.0
Oxygen content	% m/m	-	2.7
Oxygenates			
- Methanol (stabilising agents must be added)	% v/v	-	3
- Ethanol (stabilising agents may be necessary)	% v/v	-	5
- Iso-propyl alcohol	% v/v	-	10
- Tert-butyl alcohol	% v/v	-	7
- Iso-butyl alcohol	% v/v	-	10
- Ethers containing 5 or more carbon atoms per molecule	% v/v	-	15
- Other oxygenates <sup>7</sup>	% v/v	-	10
Sulphur content	mg/kg	-	150
Lead content	g/l	-	0.005

<sup>1</sup> Test methods shall be those specified in EN 228. Any change to a test method in EN 228 shall only be binding on the Member States if the new method gives at least the same accuracy and at least the same level of precision as the test method it replaces.

<sup>2</sup> The values quoted in the specification are ‘true values’. In the establishment of their limit values the terms of ISO 4259 ‘Petroleum products - Determination and application of precision data in relation to methods of test’ have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

<sup>3</sup> Unleaded Regular grade petrol may be marketed with a minimum motor octane number (MON) of 81 and a minimum research octane number (RON) of 91.

<sup>4</sup> The summer period shall begin no later than 1 May and shall not end before 30 September. For Member States with arctic conditions the summer period shall begin no later than 1 June and shall not end before 31 August.

<sup>5</sup> For Member States with arctic conditions the vapour pressure shall not exceed 70 kPa during the summer period.

<sup>6</sup> Unleaded Regular grade petrol may be marketed with a maximum olefin content of 21 % v/v.

<sup>7</sup> Other mono-alcohols and ethers with a final boiling point no higher than that stated in EN 228.

## ANNEX II

### ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES EQUIPPED WITH COMPRESSION IGNITION ENGINES

*Type: Diesel fuel*

Parameter <sup>1</sup>	Unit	Limits <sup>2</sup>	
		Minimum	Maximum
Cetane number		51.0	-
Density at 15 °C	kg/m <sup>3</sup>	-	845
Distillation:			
- 95% (v/v) recovered at	°C	-	360
Polycyclic Aromatic Hydrocarbons	% m/m	-	11
Sulphur content	mg/kg	-	350

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<sup>1</sup> Test methods shall be those specified in EN 590. Any change to a test method in EN 590 shall only be binding on the Member States if the new method gives at least the same accuracy and at least the same level of precision as the test method it replaces.

<sup>2</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products - Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

## ANNEX III

### ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES EQUIPPED WITH POSITIVE-IGNITION ENGINES

*Type: Petrol*

Parameter <sup>1</sup>	Unit	Limits <sup>2</sup>	
		Minimum	Maximum
Research octane number		95	-
Motor octane number		85	-
Vapour pressure, summer period <sup>3</sup>	kPa	-	60.0 <sup>4</sup>
Distillation:			-
- percentage evaporated at 100 °C	% v/v	46.0	
- percentage evaporated at 150 °C	% v/v	75.0	-
Hydrocarbon analysis:			
- olefins	% v/v	-	18.0
- aromatics	% v/v	-	35.0
- benzene	% v/v	-	1.0
Oxygen content	% m/m	-	2.7
Oxygenates			
- Methanol (stabilising agents must be added)	% v/v	-	3
- Ethanol (stabilising agents may be necessary)	% v/v	-	5
- Iso-propyl alcohol	% v/v	-	10
- Tert-butyl alcohol	% v/v	-	7
- Iso-butyl alcohol	% v/v	-	10
- Ethers containing 5 or more carbon atoms per molecule	% v/v	-	15
- Other oxygenates <sup>5</sup>	% v/v	-	10
Sulphur content	mg/kg	-	50
	mg/kg	-	10 <sup>6</sup>
Lead content	g/l	-	0.005

<sup>1</sup> Test methods shall be those specified in EN 228. Any change to a test method in EN 228 shall only be binding on the Member States if the new method gives at least the same accuracy and at least the same level of precision as the test method it replaces.

<sup>2</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products - Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

<sup>3</sup> The summer period shall begin no later than 1 May and shall not end before 30 September. For Member States with arctic conditions the summer period shall begin no later than 1 June and shall not end before 31 August.

<sup>4</sup> For Member States with arctic conditions the vapour pressure shall not exceed 70 kPa during the summer period.

<sup>5</sup> Other mono-alcohols and ethers with a final boiling point no higher than that stated in EN 228.

<sup>6</sup> In accordance with Article 3.2, by no later than 1<sup>st</sup> January 2005 unleaded petrol with a maximum sulphur content of 10 mg/kg must be marketed and be available on a broad geographic basis within the territory of a Member State. By 1<sup>st</sup> January 2011 all unleaded petrol marketed in the territory of a Member State must have a sulphur content of less than 10 mg/kg.

## ANNEX IV

### ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES EQUIPPED WITH COMPRESSION IGNITION ENGINES

*Type: Diesel fuel*

Parameter <sup>1</sup>	Unit	Limits <sup>2</sup>	
		Minimum	Maximum
Cetane number		51.0	-
Density at 15 °C	kg/m <sup>3</sup>	-	845
Distillation:			
- 95% (v/v) recovered at	°C	-	360
Polycyclic Aromatic Hydrocarbons	% m/m	-	11
Sulphur content	mg/kg	-	50
	mg/kg	-	10 <sup>3</sup>

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<sup>1</sup> Test methods shall be those specified in EN 590. Any change to a test method in EN 590 shall only be binding on the Member States if the new method gives at least the same accuracy and at least the same level of precision as the test method it replaces.

<sup>2</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products - Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

<sup>3</sup> In accordance with Article 4.1, by no later than 1<sup>st</sup> January 2005 diesel fuel with a maximum sulphur content of 10 mg/kg must be marketed and be available on a broad geographic basis within the territory of a Member State. In addition, and subject to the review in Article 9.1, by 1<sup>st</sup> January 2011 all diesel fuel marketed in the territory of a Member State must have a sulphur content of less than 10 mg/kg."