

## **Review of 98/70/EC – Fuel for Nonroad Mobile Machinery Joint Euromot – EMA Position**

### **1. Introduction**

Additional to our previous submissions<sup>1</sup> on technical implications this paper focuses on the cost aspects of introducing ULSD fuel by a two-step approach as proposed by DG ENV at the 6 October 2005 stakeholders meeting.<sup>2</sup>

A potential introduction of 50 ppm S by 31 December 2009 followed by 10 ppm S fuel by 31 December 2011 will cause significant additional costs for potential users of Stage IIIB engines. NRMM manufacturers have set up the cost analysis given below to quantify the penalties users had to pay when being forced to operate Stage IIIB engines for a brief period of time on 50 ppm S fuel.

The analysis specifies:

- (a) An increase in fuel costs due to more frequent regeneration of soot filters
- (b) An increase in maintenance costs due to more frequent replacement of soot filters
- (c) Additional R&D costs for developing 50 ppm S fuel compliant versions of both engines and soot filters

The assumptions we made are as follows:

NRMM inventory based on input from various manufacturers estimating the total EU NRMM market for 2010+. As we are using proprietary data numbers may deviate slightly depending on the source, however, this will not change significantly the analysis results

As proposals for potential introductory dates for both 50 and 10 ppm S have not been clearly specified by DG ENV up to now, our calculation is based on the assumption that the fuel available for operating Stage IIIB engines will have 50 ppm S instead of 10 ppm S. Thus our calculation starts in 2011, i.e. at the introductory date of 130-560 kW Stage IIIB engines, and provides first time costs as well as annual costs for every year 50 ppm S fuel has to be used for Stage IIIB engines

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<sup>1</sup> Euromot-CECE-CEMA position paper as of 14 November 2005 and 24 August 2006

<sup>2</sup> According to their non-paper no. 8 as of 6 October 2005 DG ENV proposes to introduce 50 ppm S fuel by 31 Dec 2009 and 10 ppm S fuel (EN590 quality) by 2011. It has not been specified by DG ENV whether "by 2011" indicates 1 January 2011 or 31 Dec 2011.

Euromot, CECE and CEMA propose to introduce 10 ppm S fuel and full alignment with EN590 quality by 1 January 2009

We further assume that 50/10 ppm S fuel is available *at the engine*, i.e. the NRMM fuel distribution network has been completely flushed and neither current 1000+ ppm S fuel nor diluted qualities > 50 ppm S are available anymore. Consequently it requires to introduce low S fuel types 1-2 years in advance of the Stage IIIB introduction

Estimated R&D costs are based on experiences and calculations that were run for discussions between manufacturers and the US-EPA for introducing 15 ppm S fuel for NRMM applications in 2010

Our cost analyses are given in tables 1, 2 and 3 below. The consequences of the penalty costs on customers are discussed in detail in Section 3.

## 2. Cost Analysis

**Table 1 Additional Annual Fuel and Maintenance/Replacement Costs**

<b>Additional Annual Fuel and Maintenance Costs 50 ppm S Fuel for NRMM</b>				
Year		2011	2012	2013
Total NRMM Volume	units	200.000	215.000	220.000
% of Volume in 50 ppm countries	%	30%	20%	10%
NRMM Volume in 50 ppm countries		60.000	43.000	22.000
Operation in 50 ppm countries	hrs / yr	1.500	1.700	1.600
Average Power in 50 ppm countries	kw	100	110	120
Average Fuel Rate in 50 ppm countries	g/kw-hr	215	212	210
Total Avg Fuel Cons in 50 ppm countries	billion liters	2,12	1,87	0,97
Annual Fuel Increase due to Regen Increase from 50 ppm	%	1,5%	1,2%	1,0%
Annual Increased Fuel Cons due to 50 ppm fuel	billion liters	0,032	0,022	0,010
Annual Increased Fuel Cost due to 50 ppm fuel	€ 1,10	€ 34.977.379	€ 24.651.435	€ 10.689.521
Expected Avg Aftertreatment Life	hrs	6000	6000	6000
Shortened Life due to 50 ppm fuel	%	25%	20%	15%
Actual Life due to 50 ppm fuel	hrs	4500	4800	5100
Cost for normal Replacement	Euro / kw	€ 100	€ 95	€ 95
Increased Repl Cost due to 50 ppm fuel	Euro / kw	€ 33	€ 24	€ 17
Fleet Increased Repl Cost due to 50 ppm fuel	Euro	€ 200.000.000	€ 112.337.500	€ 44.258.824
Expect to replace twice in 10 yrs w/10 ppm Expect 3 replacements in 10 yrs w/ 50 ppm				
<b>Annualized Costs due to 50 ppm fuel</b>	Annual Fuel Cost	€ 34.977.379	€ 24.651.435	€ 10.689.521
	Annual Repl Cost	€ 20.000.000	€ 11.233.750	€ 4.425.882
<b>TOTAL ANNUAL COSTS TO USERS</b>	<b>Fuel + Repl</b>	<b>€ 54.977.379</b>	<b>€ 35.885.185</b>	<b>€ 15.115.403</b>

**Table 2 Additional Estimated R&D Costs**

<b>Estimated R&amp;D Cost to Allow 50PPM</b>	<b>Cost</b>	<b>€/\$</b>
US EPA Estimate for 10ppm in the US	\$300.000.000 € 240.000.000	1,25
EMA Estimate on Additional Engine Development due to 50ppm fuel	\$100.000.000 € 80.000.000	1,25
EMA Estimate for PM AT Redesign due to 50 ppm fuel	\$100.000.000 € 80.000.000	1,25
Total Development Cost	\$200.000.000 € 160.000.000	
<b>R&amp;D Cost / Machine for 3 year period, spread over all expected machines</b>	<b>\$1.600</b> <b>€1.280</b>	1,25

**Table 3 Summary Cost Analysis**

<b>SUMMARY COST ANALYSIS</b>	
<b>50 PPM FUEL FOR NRMM, 2011-2013</b>	
Avg One Time First Cost Penalty / Machine	<b>€1.280</b>
Avg Fuel Cost Penalty / Machine for 3 years	<b>€1.688</b>
Avg One Time AT Replacement Penalty / Machine	<b>€2.853</b>
<b><u>TOTAL CUSTOMER PENALTY / MACHINE</u></b>	<b><u>€5.820</u></b>

### 3. Probable Outcome of the Two-Step Approach

In setting emissions standards and dates, regulators in the EU, US, and Japan recognised that harmonisation was critical to ensure a complete product offering in all three areas of the world and to reduce barriers to free trade. There has been unprecedented cooperation between regulators and with the engine and vehicle manufacturers, represented through organisations including Euromot and EMA, in order to ensure harmonisation.

The harmonised engine emission regulations rely upon a harmonised fuel standard and introduction date. Disharmony in fuel will bring about the very problems regulators were seeking to avoid by having harmony in regulations. Regulators have recognised that nonroad vehicle production volumes are very low and that an attempt by one authority to get out in front of another will simply leave that geographic area without a product until enough 'critical mass' is reached. Case in point, even California, which is known for leading the world with the most stringent standards, has recognised that it is not practical to try to do so with nonroad CI engines.

#### (a) Manufacturers will not invest needed R&D for a small volume of engines over a short period of time

Manufacturers will be forced to develop engines and aftertreatment systems which are optimised for operation on 10 ppm sulphur fuel, as this is the required fuel sulphur content for certification of Stage IIIB and IV non-road vehicles in Europe, will be the eventual non-road fuel supply standard for Europe and will align with fuel standards in the USA and Japan. It is not viable for manufacturers (particularly the smaller enterprises) to invest in the needed R&D to optimise engine and aftertreatment systems to operate on 50 ppm sulphur fuel for a short period of time for the European market only.

#### (b) 50 ppm S fuel penalty not acceptable for customers

Even if manufacturers did develop engine and aftertreatment systems optimised for 50 ppm sulphur fuel, customers would not accept a 50 ppm S fuel penalty, i.e. **pay a ~5820 Euro penalty for a 50 ppm capable machine.**

#### (c) Customers will delay purchase of cleaner machines until 10ppm fuel is available

Euromot and EMA believe there is a high probability that customers will simply delay the purchase of new, cleaner machines if 10 ppm fuels are not available. This will especially be true, if within 2-3 years, the needed 10ppm fuel will be available by regulation. The added technology for cleaner engines is clearly in the best interest of the environment and national policy, but customers will not want to run the risk of misfueling and damaging their new equipment, especially if the manufacturers clearly state that 10ppm fuels are required. Euromot and EMA believe that the most expensive machines, which typically have the most powerful and highest emitting engines, will be the most likely to be delayed. Also, smaller machines which are very cost sensitive will not likely be purchased due to the risk of aftertreatment damage with incorrect fuels. The end result will be a disparity between countries with clean fuels and cleaner machines vs countries where customers delay purchase of Stage IIIB machines. Of the estimated 60,000 machines which may be needed in 2011 within countries are proposed to have only 50ppm fuel, Euromot and EMA estimate that 85%, or approximately 50,000 will be delayed in their purchase, to the detriment of local economies and local air quality.

In another context it should be remembered that regulators in the EU, US, and Japan recognised that harmonisation (or at least alignment) was critical in setting standards and

dates to ensure a complete product offering in all three areas of the world. Disharmony in fuel will bring about the very problems regulators were seeking to avoid by having harmony in regulations. Regulators have recognised that nonroad volumes are very low and that an attempt by one agency to get out in front of another will simply leave that agency without a product until enough 'critical mass' is reached.

(d) Customers may disable the aftertreatment devices on their new machines to avoid damage until 10 ppm fuel is available

Euromot and EMA expect that some customers who have no other option but to purchase new Stage IIIB machines in countries where 10ppm fuel is not available may remove the aftertreatment, controls and catalyst systems and then use 50ppm fuels. They may remove these systems to avoid damaging them until 10 ppm fuel is available in 2 to 3 years. However, doing so will cause significant risk to the engines and machines. For Stage IIIB machines, the engines are set up, with software and control strategy, to work in harmony with the aftertreatment systems in order to meet emissions requirements and component life expectations. Not only will the customers likely void any warranty that would normally be provided with the machines, the engines themselves will operate with incorrect backpressure and control system inputs, likely leading to varying exhaust system temperatures that could easily shorten engine life. Stage IIIB machine manufacturers will likely include strategies that limit operation if the aftertreatment is removed, causing customer dissatisfaction and lack of confidence in the new equipment. Euromot and EMA estimate that, of the remaining 10,000 units purchased in countries where only 50 ppm fuel available, approximately 1000 may be subject to this treatment by the customers.

(e) Customers may import 10ppm sulfur fuels from countries where it is available, until 10ppm sulfur fuel is available locally.

Euromot and EMA expect that some customers, especially larger ones with access to cross border trade for their products, will go to the additional expense and burden of importing fuels they need to operate their new Stage IIIB equipment. Euromot and EMA estimate that the remaining 9000 units will follow this approach in 2011. This approach will meet the needs of the manufacturer and customer, but require special fuel handling and care that would not otherwise be required if the 10ppm fuel was available locally. This solution could also provide a competitive advantage to larger, more well connected customers who can win projects requiring cleaner machines, putting smaller, local providers at a disadvantage or even force them out of business. This unhappy result is not in the best interests of national policymakers in any case.

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