
MEDIA ADVISORY

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Next Generation Nonroad Diesel Engines in Europe

1 The Regulatory Background

“Industry is at the heart of Europe and indispensable for finding solutions to the challenges of our society, today and in the future” said European Commission Vice-President Antonio Tajani one year ago on the occasion of the launch of the Integrated Industrial Policy for the Globalisation Era ¹. “A competitive industry is key if Europe is to remain a global economic leader.” The economic crisis had refocused attention to the importance of supporting a diverse and competitive manufacturing base. This is hardly surprising when we consider that, in Europe, manufacturing employs a quarter of people in the private sector, while another 25 percent work in industry-related services.

In January 2011, his colleague in the College responsible for Environment, Janez Potočnik, stated that “air quality is an important public health and environmental issue. Air pollution continues to cause damage to people and environment: premature deaths, shorter life expectancy, as well as substantial damage to ecosystems, crops and buildings. (...) The Commission will without further delay take measures which will help Member States comply with established EU air quality standards. These include, for example, measures on the sulphur content of bunker fuels and on reducing emissions from vehicles and machinery” ². The framework of EU air quality directives 2008/50/EC (ambient air quality and cleaner air for

¹ Communication from the Commission (DG Enterprise and Industry): Integrated Industrial Policy for the Globalisation Era. Putting Competitiveness and Sustainability at Centre Stage. COM(2010)614 – 28.10.2011.

² Statement by Environment Commissioner Janez Potočnik (DG Environment) following a debate in College on air quality. MEMO/11/31 – 18.01.2011.

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Europe) and 2001/81/EC (national emission ceilings for certain atmospheric pollutants) makes clear that member states shall ensure that the concentration in ambient air of certain pollutants, including the mass concentration of very small particulate matter (PM₁₀ and PM_{2.5}), does not exceed established limit values. The Directive additionally sets a 'national exposure reduction target' to reduce ambient concentrations further by 2020. To substantiate the debate a new study report on the impact of selected policy measures on Europe's air quality over the period 1990-2005 was published by the European Environment Agency (EEA) under the challenging title "Has Policy Improved Air Quality?"³ The selected policy measures were the Euro emission standards for road vehicles and the EU directives on industrial emissions (Integrated Pollution Prevention and Control - IPPC and Large Combustion Plants - LCP). The answer is definitely yes: Despite greater fuel use between 1990 and 2005 (+26%), significant reductions in emissions had been achieved due to the introduction of the Euro standards in the road transport sector. By 2005, emissions of CO stood 80% below those projected in a no policy scenario, emissions of nitrogen oxides (NO_x) were 40% below and fine particulate matter (PM_{2.5}) were 60% lower, with the decrease commencing in the mid-1990s. However, further improvement to Europe's air quality would occur had all countries achieved their intended emission reduction commitments between 1990 and 2010 (full application scenario), ie had all European countries implemented latest existing emission standards.

In March 2011, Günther Oettinger, responsible for Energy, joined in saying that "despite progress, our estimates show that we need a further decisive and coordinated action on energy efficiency, without which the EU will not meet its objective of 20% energy savings by 2020. It paves the way for the longer term policies needed to achieve a decarbonised and resource-efficient economy by 2050 and to place the EU at the forefront of innovation."⁴ And the same month, Commission Vice-President Siim Kallas promoted his 2050 strategy for a competitive transport system guaranteeing that it "will increase mobility, remove major barriers in key areas and fuel growth and employment. At the same time, the proposals will dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050"⁵.

In a matter of months, the European Commission has been setting the scene for industrial research on next generation clean vehicle technologies reducing NO_x, SO_x, PM and CO₂ emissions, with nonroad engines being taken more and more centre stage.

³ Impact of selected policy measures in Europe's air quality. European Environment Agency (EEA) Technical Report No 8/2010.

⁴ European Energy Efficiency Plan: Commission gears up for more savings; IP/11/271 – 08.03.2011. Communication from the Commission (DG Energy): Energy Efficiency Plan 2011; COM(2011)1009 – 08.03.2011.

⁵ Transport 2050: Commission outlines ambitious plan to increase mobility and reduce emissions; IP/11/372 – 28.03.2011. White Paper (DG Transport): Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system; COM(2011)144 – 28.03.2011.

2 Current nonroad regulatory emission requirements in the EU

The emissions from newly purchased offhighway equipment for construction, agriculture and industrial activities within the EU had been progressively reduced since the publication of the first nonroad engine emission limits in 1997 ⁶. The manufacturers of this nonroad mobile machinery (NRMM) and their engines have been committed to continue with this significant environmental improvement: Commencing 1st January 2011 a further very aggressive reduction in the overall mass emissions of particulate matter (PM) is being progressively provided by the phased introduction of new EU NRMM Stage IIIB machines. This new equipment will reduce these emissions by around 90% compared with 2010 (EU NRMM Stage IIIA) limit values, in addition to reducing the emissions of oxides of nitrogen (NO_x) by as much as 50%.

Currently, engine manufacturers are getting ready for a new near-zero emission era in diesel engine design since Europe prepares for some of the toughest emission standards in the world: Euro VI for heavy-duty onhighway engines from 2013 on and EU NRMM Stage IV/US EPA Tier 4 final for offhighway following one year later in 2014. EU NRMM Stage IV will further reduce the NO_x emissions by another 80 to 90%. EU NRMM Stage IV/US EPA Tier 4 final compliant engines are about to be introduced to the markets soon and are already presented at the major trade exhibitions worldwide. Electronically controlled CI engines fuelled with low-sulphur diesel will significantly lower emissions, enhance engine monitoring & control and improve performance to meet the forthcoming level of emission standards. The most important engineering tasks were to:

- Achieve optimal performance, fuel economy and flexibility for applications plus high reliability and durability to reduce maintenance costs.
- Develop/combine exhaust aftertreatment systems to reduce emissions and meet the integration challenges of aftertreatment systems and their impact on engine technology (eg integration of cooling systems, radiators, charge air packages, etc.). Aftertreatment systems cannot be simply transferred from onhighway to nonroad engines but require substantial development work and specially developed components and systems.
- Assure proper use of the emission reduction systems in operation and monitor real world emissions during service life (in-service conformity).
- Develop intelligent retrofitting technologies to adapt the existing fleet to the latest emission standards where replacement by new engines is not possible.

All these challenges are going to be met. The internal combustion engine industry associated in EUROMOT is fully committed to deliver robust, cost-effective and resource-efficient measures to improve the air quality in Europe. We are currently focused on finalising together with the European Commission's Enterprise and Industry Directorate a heavy package of

⁶ Directive 1997/68/EC, as amended by Directives 2002/88/EC, 2014/26/EC and 2010/26/EC, relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in nonroad mobile machinery; OJ L59 - 16.12.1997.

amendment proposals to the EU NRMM Directive 1997/68/EC, part of them are required for the full implementation of the aforementioned Stage IV, another part will address new emission limit requirements for categories not fully covered yet. In addition, we are contributing to developing a harmonised NRMM retrofit certification scheme in the framework of the UNECE World Forum for Harmonization of Vehicle Regulations (Working Party on Pollution and Energy GRPE – Informal Working Group on Retrofit Emission Control (REC) Devices). EU Stage IV requires nonroad engines to comply with emission limits that are equal (NO_x) or only marginally different (PM) to the latest Euro VI limits for heavy-duty engines, however, our manufacturers need to achieve these very challenging limits with a fuel quality that has been, apart from the sulphur content, left completely undefined by the corresponding EU regulations. The availability of high quality diesel fuel for nonroad applications will have to play a central role in all future debates on policy measures to reduce emissions from our sector.

3 Next stage of nonroad legislation in Europe

As mentioned before, nonroad mobile machinery (NRMM) has now been identified by the Environment Directorate of the European Commission, by Parliament and some Member States as a ‘significant’ source of PM and NO_x in Europe. All future air quality regulations will look carefully at the contribution of this source to the identified air quality-related environmental and health problems. The European legislator therefore will launch in 2012 an impact assessment study to establish a next stage of emission requirements for NRMM that could move even closer to heavy-duty Euro VI by investigating into options for establishing new metrics for the reduction of particulate matter, specifically considering a particulate number (PN) limit. The assessment of PM reducing devices requiring at least 90% particle removal efficiency and a particle number criterion is under consideration.

This request from the legislator calls for the need to scientifically evaluate the contribution from the nonroad mobile machinery sector to air pollution in Europe and, as a consequence, the potential establishment of new requirements where appropriate. From the engine manufacturers point of view, key prerequisites for any new measures were:

- New requirements are only applicable to the engine categories highest populated: Any potential new measures need to address first land-based variable speed CI engines of $130 \leq \text{Max Power} < 560 \text{ kW}$, and subsequently $56 \leq \text{Max Power} < 130$.
- Timing: (a) 4-5 years stability period in between two successive stages, (b) minimum lead time of 3 years from publication of the new standard to placing on the market of the engines which are requested to comply with the new requirements.
- Several policy options have to be investigated (including “do nothing”) with respect to the actual limit values of new metrics.
- A full impact assessment will have to be conducted investigating into the environmental benefits, technical feasibility and economic benefits of each of the proposed options.

Furthermore the internal combustion engine industry believes that the progressive implementation of EU Stages IIIB (2011-2013) and IV (2014 onwards) will result in a very significant reduction of air pollutants emitted by nonroad mobile machinery, whereas the progress from EU Stage IV to a next stage of emission limits is anticipated to provide a much lower reduction potential than moving from previous Stage IIIA to IIIB / IV. However, EUROMOT notes that the EU Member States are severely challenged to comply with air quality targets as required by the aforementioned framework directives. As an outcome, after having tackled the major contributors to air pollution, meanwhile also industry sectors with a minor share are moving into the focus of regulators. A comprehensive review of both air quality directives and related policy measures has been initiated this summer by the European Commission's Environment Directorate. EUROMOT has been provided the opportunity to contribute to this process.

In this context, and with a view to industry's need for planning certainty, we fully support the development of a roadmap outlining potential further measures on the emissions of nonroad mobile machinery in the EU. Specifically the following issues are to be addressed:

1. The proposed impact assessment study supporting the establishment of further provisions considers aspects of global alignment of any further stage.
2. The IC engine and equipment industries are not only challenged by new air quality requirements to improve public health but also by various energy efficiency / low-carbon policy initiatives managed by the Climate Action, Energy and Transport Directorates. These aspects should be fed into an holistic approach on decarbonised next generation clean engine and vehicle technologies in Europe and eventually be managed by one focal point in the European Commission, such as EC DG Enterprise and Industry and the Commission's Joint Research Centre (JRC).

**Michael G. Hawkins,
President of EUROMOT:**

“EUROMOT accepts that the legislator is required to improve the air quality in Europe, and, since 1997, we have continuously delivered significant environmental improvements in clean engine technology. Nevertheless, it is recognised that existing fleet will be in use throughout the EU for many years more. To obtain an immediate reduction of emissions from offhighway engines and equipment in Europe, the legislator should focus on achieving a full application scenario of latest existing vehicle emission standards across the EU. For the NRMM sector, we would welcome government programmes promoting and incentivising the purchase of new machines and equipment which will additionally meet the latest safety and noise emission standards. These programmes should also recognise that, where renewal is not possible, repower and rebuild solutions are available today that can reduce emissions whilst offering benefits to the end user in the form of improved fuel consumption and productivity, extending the useful life of the machinery at a fraction of the cost of a new machine.”

3. The proposed impact assessment study shall consider other measures for reducing emissions and pollutants rather than setting new ELVs. Accelerated emission reduction, for example, could be achieved by the incentivised renewal of the engines and machines in field. The major advantage of regulating legacy fleet over regulating new engines only would be a higher number of equipment meeting the latest emission, safety and noise requirements within a short period of time.

To meet upcoming requirements with intelligent and competitive solutions, industry needs stability and sufficient lead time in between two stages. The increasingly stringent emission standards challenge engine manufacturers to an unprecedented degree since nonroad engines need an extremely flexible engine architecture to be suitable for a large width of different applications in terms of design, duty cycles and operational conditions. In addition, industry needs policy support to maintain its strong, diversified and competitive industrial base in Europe. For a policy to be sustainable it has to ensure a high level of resource efficiency, environmental protection and, last but not least: affordability. The benefits to society will be low if there is no cost-incentive to stimulate the procurement behaviour of the end-user who will have to pay the final bill.

EUROMOT is the European Association of Internal Combustion Engine Manufacturers. It is committed to promoting the central role of the IC engine in modern society, reflects the importance of advanced technologies to sustain economic growth without endangering the global environment and communicates the assets of IC engine power to regulators worldwide.

For more than 20 years we have been supporting our members - the leading manufacturers of internal combustion engines in Europe, USA and Japan - by providing expertise and up-to-date information and by campaigning on their behalf for internationally aligned legislation.

The EUROMOT member companies employ all over the world about 200,000 thoroughly skilled and highly motivated men and women. The European market turnover for the business represented exceeds 25 bn euros.

Our **EU Transparency Register** identification number is [6284937371-73](#).

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