WRITTEN STATEMENT
OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE
U.S. ENVIRONMENTAL PROTECTION AGENCY'S
PROPOSED NONROAD DIESEL ENGINE STANDARDS AND DIESEL SULFUR CONTROL

AUGUST 20, 2003

MECA is pleased to provide testimony in support of EPA's proposed nonroad diesel engine standards and nonroad diesel fuel sulfur limits. As we stated at the public hearings, MECA believes an important opportunity exists to significantly reduce emissions from nonroad diesel engines by utilizing an engineered systems approach that incorporates and combines advanced engine designs, advanced emission control technology, and very low sulfur diesel fuel. EPA's proposal recognizes the importance of promoting this systems-type approach and the Agency's regulatory initiative constitutes a carefully crafted and balanced program. If the program is finalized, it will result in substantial, cost-effective emission reductions over the next several decades. Indeed, EPA's initiative will bring about the era of the truly clean nonroad diesel engine.

MECA is a non-profit association made up of the world's leading manufacturers of mobile source emission controls. MECA member companies have over 30 years of experience and a proven track record in developing and commercializing exhaust emission control technologies. A number of our members have extensive experience in the development, manufacture, and commercial application of emission control technologies for diesel engines, including engines used in nonroad applications. If the EPA's proposed nonroad diesel engine standards and diesel fuel sulfur control program is adopted, these companies are committed to make the necessary investments to ensure that the emission control technology needed is available. A recent survey of MECA's members revealed that our industry is investing over $1.5 billion in R & D and capital expenditures to develop, optimize, and commercialize advanced emission control technology to substantially reduce emissions from on-road and nonroad diesel engines.

TECHNOLOGICAL FEASIBILITY OF THE PROPOSED DIESEL HDE STANDARDS

Overview

MECA believes the proposed exhaust and crankcase emission standards for nonroad diesel engines can be achieved in a cost-effective manner within the lead-time provided, if very low sulfur diesel fuel (15 ppm maximum sulfur) is available. Indeed, we anticipate that in response to a growing demand for low-emitting nonroad engines, improved engine designs coupled with advanced particulate matter (PM), toxic hydrocarbon (HC), and oxides of nitrogen (NOx) emission control technologies will be available on some models of nonroad engines in advance of the effective dates of the standards for use in those areas where 15 ppm sulfur diesel is available in advance of the 2010 fuel sulfur compliance deadline.

We believe any backsliding on the level of the standards or delay in the proposed implementation dates is unjustified from a technological feasibility standpoint. Further, we believe the proposed 2008 PM standard for engines less than 25 hp and the proposed 2008 PM standards for engines in the 25 to <75 hp category do not reflect the level of emission control that will be technologically feasible and should be made more stringent as discussed below. Finally, we recommend that EPA adopt a 0.14 g/bhp-hr non-methane hydrocarbon (NMHC) standard for all engines <75 hp to ensure that toxic hydrocarbons are significantly reduced.

Technologies to reduce diesel PM, such as diesel particulate filters and diesel oxidation catalysts, are commercially available today. In fact, the use of exhaust emission control technology for nonroad diesel engines is not new. For over thirty-five years, nonroad diesel engines used in the construction, mining, and materials handling industries have been equipped with exhaust emission control technology – initially with diesel oxidation catalysts (DOCs) and followed later by diesel particulate filters (DPFs). These systems have been installed on vehicles and equipment both as original equipment and as retrofit technology on over 250,000 nonroad engines worldwide.

Technologies such as DPFs and NOx adsorbers, as well as the integration strategies being developed to meet the 2007 and 2010 heavy-duty on-road diesel engine standards, generally can be applied to nonroad diesel engines and vehicles. Also, SCR, which has been widely used on stationary engines and in some mobile source applications on a limited basis, is another possible NOx control option. Exhaust gas recirculation (EGR) technology, which is being used on highway HDEs and is being evaluated on nonroad engines as a retrofit option, will also be an available option to help meet the proposed standards. Finally, lean-NOx catalyst technology, which has been utilized in passenger car applications in Europe and is an available retrofit technology for on-road HDEs, is a strategy that could be used to help meet the possible less stringent NOx standards being contemplated for several of the smaller engine categories of nonroad diesel engines. A comprehensive list of references discussing the considerable progress in developing, optimizing, and applying advanced emission control technologies and strategies for reducing emissions from diesel engines can be found in *Diesel Emission Control: 2001 in Review*, SAE Paper No. 2002-01-0285 (2002 SAE Congress, Detroit) and *Diesel Emission Control: 2002 in Review*, SAE Paper No. 2003-01-0039 (2003 SAE Congress, Detroit).

PM, Toxic HC, NOx Emission Control Technology Capability and Experience

MECA concurs with EPA's conclusion that, while important differences exist, nonroad diesel engines operate fundamentally like on-road diesel HDEs. With the availability of 15 ppm sulfur fuel and adequate leadtime, we agree with the Agency that nonroad diesel engines can be successfully designed to utilize the advanced emission control technology that will be employed to meet the on-road HDE standards, which take effect beginning in 2007 and will be fully implemented by 2010.

MECA supports EPA's conclusion that filter technology with PM control efficiencies of up to 90 percent or more can be cost-effectively employed on nonroad diesel engines from 25 hp to >750 hp and that advanced, high efficiency NOx control technologies, such as NOx adsorbers, will be available for nonroad engines ranging from 75 hp to >750 hp. For nonroad diesel engines <25 hp, MECA agrees with EPA's conclusion that DOC technology is readily available to significantly reduce PM, CO, and HC emissions, including those HC species identified as air toxics.

Looking to the future we also believe that other cost-effective NOx and PM control strategies may emerge for these smaller engines, including such technologies as lean NOx catalysts (capable of reducing NOx by up to 25 percent or more) and lower efficiency DPFs (capable of reducing PM by 50-60 percent). Similarly, with regard to nonroad diesel engines in the 25 to <75 hp range, we believe cost-effective NOx control strategies (such as lean NOx catalyst technology or possibly low-pressure EGR) will emerge. Therefore, we recommend that as part of EPA's proposed 2007 technical review of emissions standards for nonroad diesel engines <75 hp, the Agency assess the availability of cost-effective PM and NOx controls and tighten the requirements if appropriate.

Diesel Particulate Filters (DPFs) – As noted above, DPFs are commercially available today. Over 70,000 on-road heavy-duty vehicles and 500,000 diesel passenger cars in Europe have been equipped with this technology. For nonroad engines, DPFs have been successfully installed and used on mining, construction, and materials handling equipment. In these nonroad engine applications, DPF systems have been successfully designed to function effectively over the specific duty cycle of the engine. DPF technology is projected to be utilized on highway heavy-duty diesel engines sold in the U.S. beginning with the 2007 model year. Indeed, DPFs are currently available on selected on-road diesel vehicles in the U.S. and Europe. This technology has demonstrated impressive durability characteristics in commercial operation in the U.S. and Europe and will be used across the board on diesel vehicles and engines in Japan beginning in 2005. Also, a growing number of different filter system designs and strategies – both passive and active – are emerging.

Where diesel fuel with <15 ppm sulfur is used, precious metal catalyst-based diesel particulate filters (CB-DPFs) have consistently demonstrated the capability to reduce PM emissions on a mass basis by up to 90 percent or more. In addition, this technology has proven effective in reducing the carbon-based PM by up to 99.9+ percent, while significantly reducing particle numbers over the full range of particle size, including ultra-fine particles. Finally, CB-DPF technology, has demonstrated the capability to reduce a wide range of toxic hydrocarbon species and PAHs by up to 80 percent or more.

Also, particulate filter systems are emerging that are specially designed to provide exhaust flow turbulence and increased particulate residence time, and have achieved PM reductions in the 40 to 65+ percent range. One design is being evaluated for passenger car and heavy truck application in Europe (see, e.g., *New Diesel Catalyst systems to Achieve European Legislation – Tested on a Volvo S60 Passenger Car*, 24th Vienna Motor Symposium, May 15-16, 2003, Vienna, Austria). Another design is being developed by a different manufacturer for nonroad engine applications, including engines under 50 hp.

Diesel Oxidation Catalysts (DOCs) – DOC technology is available today and represents a cost-effective, interim PM control strategy for nonroad engines <75 hp. Indeed, this technology could be applied to virtually the entire range of nonroad engine applications in 2008 when the 500 ppm sulfur diesel is available. Over 250,000 nonroad vehicles and equipment, including mining vehicles, skid steer loaders, forklift trucks, construction vehicles, and stationary engines, as well as over 35,000,000 diesel passenger cars and over 1.5 million trucks and buses worldwide have been equipped with DOCs.

NOx Adsorber Technology – MECA concurs with EPA's assessment that NOx adsorber technology, which the Agency and MECA anticipate will be utilized to help meet the 2007/2010 on-road HDE standards, will also be an available NOx control strategy to help meet the NOx standards applicable to nonroad engines >75 hp. NOx adsorber catalysts are currently being used commercially in light-duty gasoline direct injection (GDI) engines. This technology continues to undergo extensive research and development in anticipation of the U.S. 2007/2010 on-road heavy-duty diesel engine regulations to help significantly reduce NOx emissions. The progress in developing and optimizing this technology has been extremely impressive. Indeed, the Clean Diesel Independent Review Panel, charged by EPA to assess the technological progress in meeting the 2007/2010 standards, concluded late last year that NOx adsorber technology development was on track to help meet the on-road HDE standards and no technological roadblocks were identified.

The current focus of NOx adsorber technology development and optimization is on: 1) expanding the operating temperature window in which the technology will perform, 2) improving the thermal durability of the technology, 3) improving the desulfurization methods and performance, and 4) improving system packaging and integration. The progress being made in these areas continues to be impressive. In light-duty applications, several automobile manufacturers are conducting field tests with NOx adsorber/DPF systems and one manufacturer has announced plans to sell vehicles equipped with such a system in Japan and in Europe in the near future. While NOx adsorber catalysts are not currently available for nonroad diesel engines, we believe NOx adsorbers and the associated engine technologies will be available for use on nonroad diesel engines within the leadtime provided in the proposal. The incorporation of on-highway type fueling systems will allow for the use of NOx adsorber technology on smaller diesel engines as well.

Selective Catalytic Reduction (SCR) Technology – SCR technology is another NOx control strategy that could be utilized to help meet the proposed nonroad diesel emission standards. SCR has been used to control NOx emissions from stationary sources for over 15 years. More recently, it has been applied to select mobile sources including trucks, marine vessels, and locomotives. In 2005, SCR is expected to be introduced on on-road diesel HDE engines to help meet the Euro 4 emission standards. Applying SCR to diesel-powered engines provides simultaneous reductions of NOx, PM, and HC emissions. Beginning in the mid-1990s, SCR technology has been installed a variety of marine applications in Europe including ferries, cargo vessels, and tugboats. The capacity of the engines equipped with SCR ranged from 450 to over 10,000 kW.

Low-Pressure EGR – This technology is being successfully demonstrated in retrofit applications on trucks, buses, and other applications. Over 1500 systems are running worldwide. Low-pressure EGR has demonstrated a NOx control capability in the range of 30 to 60 percent. With an active DPF and <15 ppm sulfur diesel, control levels as high as 80 percent may be achievable. Current experience with low-pressure EGR is in the 185-440 hp range, but the technology could be optimized for a larger range of engine categories. This technology is expected to be an available option for nonroad engines.

Lean NOx Catalyst (LNC) Technology – This technology, which has been utilized in passenger car applications in Europe, recently was verified by the California Air Resources Board (25 percent NOx control) in retrofit applications. This technology, which is being used in combination with both DPFs or DOCs, is being demonstrated and commercialized for a variety of nonroad applications, including heavy-duty earthmoving equipment, agricultural pumps, and portable engines.

Crankcase Emission Controls – EPA has proposed the control of crankcase emissions from turbocharged nonroad diesel engines. Currently on diesel engines, a rudimentary filter may be installed on the crankcase breather (the vent for the oil reservoir), but a substantial amount of particulate matter is released to the atmosphere. For diesel engines used in motor vehicle applications, emissions through the breather may exceed 0.7 g/bhp-hr during idle conditions on recent model year engines.

One solution to this emissions problem is the use of a multi-stage filter designed to collect, coalesce, and return the emitted lube oil to the engine's sump. Filtered gases are returned to the intake system, balancing the differential pressures involved. Typical systems consist of a filter housing, a pressure regulator, a pressure relief valve and an oil check valve. These systems have the capability to virtually eliminate crankcase emissions. This technology is currently being used in Europe and will be used on highway diesel heavy-duty engines in the U.S. beginning in 2007.

Emission Control Technology Can and Has Been Applied to Nonroad Engines

Proper integration of emission control technology on nonroad vehicles and equipment is important for three reasons: 1) to ensure the system is installed at the appropriate place in the exhaust system to enable the control device to function at optimum effectiveness, 2) to ensure the system physically fits in the available space, and 3) to ensure safety. Over 25 years of experience in integrating emission control technologies on a variety of diesel and SI nonroad vehicles and equipment ranging from <25 hp to over 750 hp provides a clear indication that emission control technology can be successfully integrated on a wide range of nonroad vehicles to meet EPA's proposed standards. This experience has also demonstrated that, by taking a systems approach, exhaust technology can be applied to achieve required emission reductions without compromising engine performance, engine durability, or safety. For example, both DOCs and DPFs have been successfully integrated on nonroad diesel engines ranging from >75 hp (e.g., materials handling equipment) to over 750 hp (e.g., mining equipment, locomotives and stationary engines).

Two examples of integrating emission control technologies on very small engines (25 hp or less) include: 1) the successful design and installation of over 15 million catalysts worldwide on small motorcycles and mopeds, and 2) the installation of over one million catalyst devices on a variety of lawn and garden equipment including chainsaws, trimmers, and lawn mowers in the U.S. and Europe. The same type of innovations in design and packaging can be applied to even the smallest-sized nonroad diesel engines.

Experience with over 250,000 nonroad diesel engines and millions of small SI engines has also shown that emission control systems can be successfully integrated to ensure the safety of the vehicle operator and others. In addition, exhaust emission control technology can be and has been designed for and integrated on to vehicles to address special operating concerns and environments. For example, where equipment is used in explosive operating environments, such as underground coal mines, emission control technology has been designed to meet special surface temperature requirements. Finally, exhaust emission control technologies can be and have been installed on vehicles so as not to impair operator visibility.

Some varieties of nonroad equipment operate in rigorous environments and/or experience significant engine vibration. Therefore, an important aspect of vehicle integration is to ensure that emission control technology can withstand the vibration and or extreme operating conditions associated with the operation of certain nonroad vehicles. Emission control technology can be designed, installed, and operated to provide effective, reliable, and durable performance under these extreme conditions. This fact is demonstrated by the systems that have been used in underground mining applications for years – DOCs having been in service for the life of the vehicle and DPFs having been installed on equipment that has operated for over 15,000 hours in rugged work environments and still provided effective emission reduction performance. Finally, the fact that exhaust emission control technologies have been used for many years in nonroad applications and proven to be durable attests to the fact the technologies can withstand the dust and moisture associated with many of the nonroad environments where the technologies have been used.

A more detailed discussion of the emission control technologies for nonroad diesel engines, operating experience, and application considerations can be found in a document prepared by MECA entitled *Exhaust Emission Controls Available to Reduce Emissions from Nonroad Diesel Engines*. A copy of this report is attached to this statement.

Emission Control Technology Cost

EPA, in its draft Regulatory Impact Analysis, presents a thorough discussion of the costs of DOCs, DPFs, and NOx adsorber technology. EPA's costs estimates in general are in a reasonable range. Of course, costs can vary depending on the particular characteristic of a given engine and/or engine/equipment application. Also, experience has shown that the cost of emission control technologies tend to decrease over time as the volume of product needed increases and the technologies are further optimized to minimize complexity and cost. Individual MECA members have provided more detailed information on cost issues.

The Emission Control Technology Industry Will Be Able to Provide Product and Technical Support to Enable Nonroad Engines to Help Meet the Applicable Emission Standards

During the public hearings some engine and equipment manufacturers expressed concern that the emission control industry might not be able to provide the technical assistance needed to optimize emission control technologies for the wide variety of engines and engine/equipment applications. Our industry will have the capacity to engineer prototypes, provide technical assistance, and manufacturer the needed products in adequate quantities to meet the engineering and production schedules of the engine and equipment manufacturers over the full range of engine applications covered by EPA's proposed rule. As noted above, MECA member companies plan to spend over $1.5 billion to develop and manufacture diesel emission control technology for diesel engines. A significant portion of those expenditures is targeted at increasing the manufacturing capacity to meet the anticipated demand. Also, the number of companies developing and manufacturing emission control technologies for diesel engines continues to grow. EPA's proposed sequencing and phasing-in of emission standards for various engine sizes and with provisions for ample lead times will further facilitate meeting product demand. Over the 30 years of the U.S. mobile source emission control program, concerns have been raised regarding the ability of the emission control industry to provide needed technical assistance and product in a timely fashion to meet new standards. Our industry has consistently demonstrated the ability to deliver both the technical assistance and the volume of product needed in a timely fashion.

Specific Comments Related to the Proposed Emission Standards for the Various Engine Categories

Less than 25 hp Engine Category – The only standard EPA proposes for engines in the <25 hp is a 3.0 g/bhp-hr PM standard in 2008. The proposed standard does not reflect the level of emission control that is technologically feasible. EPA discusses in the proposal the adverse effects of toxic HC emissions from this category of engines and states that DOCs can effectively reduce these harmful emissions. MECA concurs with EPA's assessment. DOCs have demonstrated the ability to reduce total PM by up to 50 percent and toxic HC by up to 70 percent. DOC technology is available now for use diesel engines <25 hp. However, the PM standard proposed by EPA likely will be met with engine modifications alone and is not sufficiently stringent to necessitate the use of DOC technology. Also, EPA has failed to propose an HC standard for this category of engines. As a result, an important opportunity to reduce the operator's and others' exposure to harmful PM and toxic HC emissions will be lost.

In order to meet the mandates of the Clean Air Act to establish standards for nonroad engines that reflect the level of control that will be technologically feasible and to better protect the health of the equipment operator and others, we believe EPA should finalize a more stringent PM standard than proposed and should adopt an NMHC standard. MECA recommends that the PM standard be tightened in the range of 30 percent and that the 0.14 g/bhp-hr NMHC applicable to nonroad engines 75 hp and greater be applied to engines <25 hp.

EPA has not proposed a second set of standards for engines in the <25 hp category. MECA believes that as part of the EPA's 2007 technology review the Agency should consider the technological feasibility of setting a tighter PM standard and a NOx standard to take effect in the 2012/2013 timeframe. As noted above, additional cost-effective NOx and PM control strategies may emerge for these smaller engines, including such technologies as lean NOx catalysts (capable of reducing NOx by up to 25 percent or more) and lower efficiency DPFs (capable of reducing PM by 50-60 percent).

Engines in the 25 to <75 hp category – EPA has proposed two compliance options for this engine category. During the hearings, several testifiers called for the elimination of Option 1, which contains an interim PM standard, because it failed to meet the three-year stability rule. Since manufacturers may elect to follow Option 2, Option 1 is voluntary and the three-year stability rule does not come into play. However, if EPA decides to drop Option 1, then the effective date for meeting the 0.02 g/bhp-hr PM standard should remain 2012. MECA believes meeting the 0.02 g/bhp-hr PM standard in 2012 is technologically feasible and should not be delayed until 2013.

MECA believes Option 1 provides an opportunity to reduce harmful toxic HC and PM exposure to the equipment operators during the period 2008 to 2013. However, to maximize the potential benefits of this option, the interim 0.22 g/bhp-hr PM should be tightened to take advantage of the emission reduction potential of DOCs, as discussed above. The proposed interim PM standard can be met with engine modifications alone. MECA recommends that EPA adopt a PM standard in the range of 30 percent more stringent than the level proposed. Such a standard would reflect the emission reduction potential of combining engine modifications and DOC technology.

In addition, MECA recommends that EPA adopt the 0.14 g/bhp-hr NMHC for the engines in the 25 to <75 hp category. For engines in the 25 to 50 hp range, this standard should take effect in 2008. For engines in the >50 to 75 hp range, the 0.14 g/bhp-hr NMHC standard should take effect at the earliest possible date consistent with providing four years lead-time and three years stability with the existing NMHC standard (3.5 g/bhp-hr NMHC+NOx). The 0.14 g/bhp-hr standard would result in the use of DOC technology that will provide significant reduction in toxic HCs.

Finally, MECA recommends that EPA as part of its 2007 technology review consider the feasibility of setting tighter NOx standards for engines in the 25 to <75 hp categories in the 2012/2013 timeframe given the possibility that cost-effective NOx control strategies may emerge for these smaller engines, including such technologies as lean NOx catalysts (capable of reducing NOx by up to 25 percent or more).

Unless EPA tightens the emission control requirements for diesel engines in the 25 to <75 hp category, an inequity will be created between the emission control requirements for similar-sized SI and CI nonroad engines. This situation could create the unintended consequence that the market share of higher polluting diesel engines will increase at the expense of the very low emitting gasoline, CNG, and LPG fueled-engines. The engines at issue include engines used to power equipment such as forklifts, sweepers, pumps, ground support vehicles, and generators used in agricultural, commercial, construction, and industrial applications. EPA estimates that over 150,000 SI engines in the >25 hp category are sold in the U.S. annually and that over 230,000 diesel engines in the 25 to 70 hp category are sold annually.

Beginning in 2004, SI engines will be required to meet increasingly stringent standards. When fully implemented in 2007, the rule will result in a 70 percent reduction in HC, an 85 percent reduction in NOx, and a 90 percent reduction in CO. In addition, PM emissions from these engines will be very low. To meet the 2007 standards, EPA notes that fuel system technologies and catalyst technology can be further optimized. EPA estimated the increased per engine production costs of complying with the 2007 standards compared to the costs of a pre-2004 engine would be as follows: $860 for gasoline, $590 for LPG, and $590 for natural gas. By contrast, manufacturers of diesel engines in the 25 to <75 hp category have the option of meeting very modest HC+NOx standards until 2012 that will be met with relatively inexpensive engine modifications. These diesel engines will emit significant levels of PM and toxic HC emissions according to EPA's own analysis.

Engines in the 75 to 750 hp Category – As noted above, MECA concurs with EPA's assessment that the proposed standards are technologically feasible given the lead time provided and that the technologies that are being developed to meet the 2007/2010 on-road HDE standards will be readily available to this category of nonroad engines.

Engines in the Greater than 750 hp Category – During the public hearing, concerns were expressed regarding the technological feasibility and hardware costs in meeting the proposed 0.01 g/bhp-hr PM and 0.30 g/bhp-hr NOx standard. While integrating emission control technology on large engines is challenging, these challenges can and have been met. For example, DOCs, DPFs, and SCR have been installed successfully on large engines such as mining equipment, switcher locomotives, commercial marine engines, and/or stationary IC engines. Indeed, the larger size of the vehicles on which these engines are used is typically beneficial when integrating engine/emission control technology for optimum performance. The emission control industry has growing experience in integrating emission control equipment in unique and challenging applications in a cost-effective manner. With regard to costs, we anticipate that the cost of emission control technology will be a relatively small portion of the engine and equipment costs for these very large engine/equipment applications. We believe the eight years of lead-time to meet the PM standard and the 11 years to fully meet the NOx standard provides more than adequate time for our industry to develop, engineer, and make commercially available the emission control products that will be needed to help meet the standards applicable to engines >750 hp.

THE NEED FOR LOW SULFUR DIESEL FUEL

15 ppm Sulfur Limit

The adverse impacts of sulfur in diesel fuel on catalyst-based diesel particulate filters and NOx adsorbers, cited by EPA in its proposal as the technologies that in all likelihood will be used to help meet the proposed nonroad diesel emission standards, is now clearly established and is well documented in the EPA proposal. As is the case with meeting the 2007/2010 on-road HDE standards, <15 ppm diesel sulfur fuel is absolutely essential for meeting EPA's proposed PM standards for nonroad diesel engines 25 to >750 hp and EPA's proposed NOx standards for nonroad diesel engines 75 to >750 hp.

Sulfur affects precious metal catalyst-based diesel particulate filter performance by inhibiting the performance of catalytic materials upstream of or on the filter. This phenomenon not only adversely affects the ability to reduce emissions, but also adversely impacts the capability of these filters to regenerate – there is a direct trade-off between sulfur levels in the fuel and the ability to achieve regeneration. Sulfur also competes with chemical reactions intended to reduce pollutant emissions and creates particulate matter through catalytic sulfate formation. The availability of very low, <15 ppm sulfur fuel will enable these filters to be designed for improved PM filter regeneration and emission control performance, as well as to minimize any increase in sulfate emissions. Indeed, diesel fuel containing <15 ppm sulfur is required to ensure maximum emission control performance on the broadest range of diesel nonroad engines possible.

Diesel fuel with less than 15 ppm sulfur is absolutely essential to commercializing NOx adsorber systems that can function effectively both for on-road and nonroad diesel engine applications. At higher sulfur levels, a NOx adsorber quickly becomes ineffective as the sulfur attaches to the sites meant to “trap” the NOx. The sulfur remains attached to these sites until high temperature, rich conditions, which are not characteristic to normal diesel engine operation, are met.

Also, while a sulfur regeneration mode or desulfurization cycle will need to be employed in any case, the frequency of desulfurization must be kept to a minimum to avoid substantial fuel economy penalties and perhaps a degradation of the NOx adsorber performance that, in turn, will require an even more frequent desulfurization. As the sulfur level increases, the frequency, as well as the severity, of regenerations needed increases.

The effectiveness of other NOx control technologies, such as SCR and lean NOx catalyst technology, that may play a role in reducing emissions from nonroad diesel engines would greatly benefit from the use of <15 ppm in terms of improved emission control performance and minimization of the sulfate formation when precious metals are used. Finally, while DOC technology will function effectively with <500 ppm fuel, the availability of 15 ppm will improve overall catalyst PM control efficiency by reducing the sulfate production and will enable the utilization of more active catalyst formulations that could provide greater reductions in toxic HC and the soluble organic fraction (SOF) of the PM emissions.

MECA supports the concept of extending the 15 ppm sulfur limit to diesel fuel sold for use by marine vessels and locomotives. If 15 ppm sulfur fuel were available for these engines, it would open the possibility for the use of the type of advanced emission control technology that will be used on other categories of nonroad engines and on-road heavy-duty diesel engines to provide significant PM, NOx, and toxic HC emission reductions. We also support initiating a rulemaking in the future to set standards to further reduce emissions from locomotives and marine vessels. We believe with the availability of 15 ppm sulfur fuel and with adequate lead-time significant emission reductions from these categories could be achieved using advanced emission control technology.

Low Sulfur Lubricating Oil

MECA supports the introduction of low sulfur lubricating oil. Once sulfur in diesel fuel is reduced to <15 ppm, the percent contribution of sulfur from lube oil that enters the exhaust stream becomes significant. The introduction of low sulfur lubricating oil would greatly facilitate the further optimization and introduction of PM and NOx control technologies that are sensitive to sulfur.

Interim 500 ppm Sulfur Limit

MECA also supports the implementation of the interim 500 ppm sulfur limit. Reducing sulfur in nonroad diesel fuel from the current levels will not only provide direct air quality benefits and enhance engine durability, but will also enable the use of diesel oxidation catalyst technology. As noted above, this technology can control PM emissions from 20 to 50 percent and reduce toxic HCs by up to 70 percent. As discussed above MECA recommends that EPA establish a 0.14 g/bhp-hr NMHC standard to ensure the use of DOC technology and thus achieve significant reductions in toxic HC emissions.

EMISSION TESTING PROCEDURES

MECA supports the proposed test procedures including the NTE requirement. We believe it is important that certification test procedures reflect real world emission performance to the greatest extent possible. The proposed emission test procedures achieve this objective. Meeting the proposed nonroad emission standards over the proposed certification test procedures will be challenging, but our industry is confident emission control technologies will be available to help meet the proposed standards over the full range of testing requirements.

HARMONIZATION

MECA supports the concept of harmonization. We believe, however, that protection of the public health should in no way be compromised in the name of harmonization. Rather, EPA should establish the emission standards based on the Clean Air Act mandate that those standards reflect the greatest emission reductions that will be technologically feasible when the standards become effective.

MEASURES TO ENCOURAGE EARLY EMISSION REDUCTIONS

MECA supports the provision of emission credits for the early introduction of new engines that meet the applicable standards and the proposed program that would allow manufacturers to elect to retrofit diesel particulate filters on existing nonroad engines. MECA also support EPA's proposed extension of its Blue Sky Engine. Our support is contingent on the credit programs as finalized being fully enforceable and verifiable.

The diesel particulate filter retrofit credit program will provide an important opportunity to expand the experience and build interest in retrofitting nonroad engines. This credit program could serve as the catalyst for promoting other initiatives to retrofit additional nonroad equipment with exhaust emission control technology.

2007 TECHNOLOGY REVIEW

MECA supports the concept of EPA conducting a technological review in 2007 for engines in the <75 hp categories, provided the review includes an assessment of the long-term PM and NOx standards for engines <25 hp and the NOx standard for engines <75 hp. As discussed above, MECA believes some very promising technologies are emerging that could be applied to smaller nonroad engines to provide meaningful PM, NMHC, and NOx emission reductions. These technologies include such concepts as flow-through DPFs and lean NOx catalyst technology at a reasonable cost and with very good performance and fuel economy.

CONCLUSION

While we recognize that the proposed nonroad diesel engine standards present engineering challenges, we also believe those challenges can and will be met. The key will be to employ the systems approach identified in EPA's proposal consisting of advanced engine designs, advanced emission control technology, and low sulfur diesel fuel. We look forward to working with EPA, the engine and equipment manufacturers, the end users, and others. Our industry is committed to do its part to ensure that, if the proposed nonroad diesel standards and diesel sulfur limits are adopted, the desired emission reductions will be achieved at a reasonable cost and with very good performance and fuel economy.