WRITTEN STATEMENT
OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE
CALIFORNIA AIR RESOURCES BOARD'S PROPOSED AMENDMENTS TO THE AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

November 13, 2006

The Manufacturers of Emission Controls Association (MECA) is pleased to provide testimony in support of the California Air Resources Board's (ARB) proposal to amend the Airborne Toxic Control Measure for Stationary Compression Ignition Engines to include emission limits for in-use stationary agricultural diesel engines.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. Our members have decades of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and non-road vehicles and equipment. A number of our members have extensive experience in the development, manufacture, and commercial application of PM and NOx emission control technologies for stationary engines. Our members have invested and continue to invest significant resources in developing and verifying diesel retrofit technologies for use on the whole range of in-use diesel engines currently operating in U.S., including on-road, non-road, and stationary sources.

As indicated in the September 2006 ARB staff report, compliance with these proposed ATCM amendments are expected to be achieved largely through the purchase of new, cleaner electric, diesel, or alternatively fueled engines for the agricultural applications covered by this proposal. Compliance may also be achieved by combining Level 3 verified diesel retrofit technologies with Tier 2 or Tier certified off-road diesel engines. MECA members are actively engaged with off-road diesel engine manufacturers to develop diesel emission control technologies such as diesel oxidation catalysts (DOCs), diesel particulate filters (DPFs), and selective catalytic reduction (SCR) technology for complying with future ARB and EPA Tier 4 off-road diesel engine standards. These advanced diesel emission control technologies will first be applied to new highway diesel engines in the 2007-2010 timeframe and then migrate into new off-road diesel engine applications in the next decade. MECA members have also verified a number of Level 3 diesel retrofit technologies for stationary diesel engines based on diesel particulate filters. These verified Level 3 PM reduction solutions for stationary engines are the basis of potential retrofit solutions that could also be used on stationary engines used in the agriculture sector to comply with the ATCM amendments proposed by ARB.

The following section provides some technical experience information for controlling PM and NOx emissions from stationary engines.

PM and NOx Emission Control Technology Capability and Experience for Stationary Diesel Engines

MECA believes that emission control technologies that may be needed to help meet the proposed emission limits for in-use stationary agricultural diesel engines are available today.

The PM and NOx control technologies that may be installed on these diesel engines are being used today on on-road and off-road applications (including many stationary diesel engines) in California and elsewhere. The proposed emission limits from in-use stationary agricultural diesel engines will provide important PM and NOx emission reduction benefits and will provide an opportunity to demonstrate the effectiveness of advanced diesel exhaust emission controls on both future new diesel stationary engines and in retrofit applications for in-use stationary diesel engines.

A number of advanced emission control technologies exist today to significantly reduce PM and NOx emissions from existing diesel engines. These include diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), selective catalytic reduction (SCR), and lean NOx catalyst technology.

Diesel Particulate Filters – Diesel particulate filters (DPFs) are commercially available today. Over 200,000 on-road heavy-duty vehicles worldwide have been retrofitted with passively or actively regenerated DPFs. In addition, over three million new passenger cars have been equipped with DPFs in Europe since mid-2000, and starting in 2007 every new heavy-duty on-road engine sold in the U.S. and Canada will be equipped with a high-efficiency DPF to comply with EPA's 2007 on-road diesel emission limits. DPFs are also now available on all new heavy-duty on-road diesel engines sold in Japan. The operating and durability performance of DPFs has been very impressive. For example, a growing number of on-road DPF-equipped heavy-duty vehicles have been successfully operating for several 100,000 miles or more. Examples of successful diesel retrofit programs employing DPFs include urban transit agencies in many large U.S. and European cities, the New York City and city of Los Angeles Departments of Sanitation fleets, which have successfully retrofitted refuse trucks with filters, and thousands of school buses across the U.S. DPFs have also been successfully retrofitted in a number of non-road applications including applications on stationary engines, construction equipment, mining equipment, and cargo handling equipment used at several large port facilities in the U.S.

High-efficiency DPF technology can reduce PM emissions by up to 90 percent or more, ultra-fine carbon particles by up to 99+ percent and, depending on the system design, toxic HC emissions by up to 80 percent or more. A number of manufacturers have already verified high efficiency (Level 3, > 85% PM reduction efficiency) retrofit DPF technologies for stationary engine applications using the California Air Resources Board's retrofit verification protocols (see http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/stationary.htm). These include both actively (using a diesel fuel burner) and passively (catalyst-based regeneration that requires minimum exhaust gas temperatures) regenerated DPF technologies for the oxidation of trapped soot. For catalyst-based DPF technologies, the use of ultra-low sulfur diesel fuel is critically important to maximizing the PM reduction efficiency and durability of these technologies.

New "partial" filter technologies are also emerging for diesel retrofit applications. These "partial" filters make use of wire mesh supports or tortuous metal substrates that employ sintered metal sheets. Three "partial" filter designs have been verified for applications by California's ARB as Level 2 PM reduction technologies (PM reduction efficiency from 50 to 85 percent). One of the ARB Level 2 verified "partial" filters is specific to applications on stationary engines while the other ARB verifications for "partial" filters are applicable to a range of on-road diesel engines. These "partial" filter designs are less susceptible to plugging and can offer PM reduction efficiencies in the 60 to 75 percent range.

Development work is underway to further enhance the performance of filter system designs. For example, work continues on developing and implementing additional active filter regeneration strategies that will expand the applications for retrofitting DPFs. Also, development work on filter materials and designs to further enhance filter system durability and to further reduce backpressure are under development. Manufacturers are also developing DPF options that minimize NO_2 emissions in systems that make use of NO_2 for filter regeneration. New, improved DPF systems continue to enter the diesel engine OE and retrofit market.

Diesel Oxidation Catalysts (DOCs) – DOC technology is available today and represents a cost-effective PM control strategy. Over 250,000 non-road vehicles and equipment, including mining vehicles, skid steer loaders, forklift trucks, construction vehicles, cargo handling equipment, marine diesel engines, and stationary engines, as well as over 50,000,000 diesel passenger cars and over 1.5 million trucks and buses worldwide have been equipped with DOCs. Control efficiencies of 20 to 50 percent for PM, up to 90 percent reductions for carbon monoxide (CO) and hydrocarbon (HC), including large reductions in toxic hydrocarbon species have been achieved and reported in tests of DOCs on a large variety of on-road and non-road diesel engines. With respect to particulate emissions, the wide range of PM reductions observed with DOCs reflects the fact that DOCs oxidize soluble hydrocarbons associated with PM (the so-called soluble organic fraction [SOF] of PM). The SOF content of PM is related in part to the oil consumption characteristics of diesel engines.

Selective Catalytic Reduction (SCR) Technology – SCR technology is a proven NOx control strategy. 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 using a urea-based reductant was introduced on a large number of on-road diesel heavy-duty engines to help meet the Euro 4 heavy-duty NOx emission standards. More than 10,000 new heavy-duty truck engines are operating in Europe equipped with SCR systems that use urea as the reductant for reducing NOx emissions. SCR is also being given serious consideration by engine manufacturers for complying with future on-road heavy-duty diesel engine emission standards in both the U.S. and Japan (in the 2009-2010 timeframe). Applying SCR to diesel-powered engines provides simultaneous reductions of NOx, PM, and HC emissions. Since the mid-1990s, SCR technology using a urea-based reductant has been installed on a variety of marine applications in Europe including ferries, cargo vessels, and tugboats with over 100 systems installed on engines ranging from approximately 450 to 10,400 kW. These marine SCR applications include the design and integration of systems on a vessel's main propulsion engines and auxiliary engines. Most recently an SCR system has been successfully installed on one of New York City's Staten Island ferries.

SCR has also been combined with DPF technology to provide simultaneous large reductions in NOx and PM emissions as well as reductions in CO and hydrocarbon emissions. In California, a 300-ton gantry crane powered by a turbocharged, after-cooled diesel engine rated at 850 kW was equipped with such a combined emission system in 2001. The expected emission reductions were an 85 percent reduction of particulate matter and a 90 percent reduction in NOx. A few combined SCR/DPF systems have also been installed on stationary diesel engines used for power production including six Caterpillar 3516B engines operating in southern California. Volvo AB, in the summer of 2004, launched 27 diesel transit buses in Sweden that are operating with a combined SCR/DPF system to reduce PM and NOx emissions below the European Euro 5 heavy-duty emission limits that do not come into force until 2008. A similar small test fleet of transit buses operating with a combined SCR/DPF system are now operating in London,

England. A number of small test fleets of heavy-duty over-the-road diesel vehicles are also operating within the U.S. to demonstrate the capabilities of combined PM and NOx control using SCR and DPFs. DOE's (U.S. Department of Energy) APBF-DEC program included the evaluation of two different combined SCR/DPF systems on a 12 liter heavy-duty diesel engine. Results on this program were reported at the 11th Annual DEER (Diesel Engine Emission Research) Conference during the week of August 21, 2005. These results included the operation of these two different SCR/DPF systems for 6,000 hours of durability with emission performance near the EPA 2010 heavy-duty on-road emission limits.

Lean NOx Catalyst (LNC) Technology – This technology has been verified by the California Air Resources Board (25 percent NOx control) for specific on-road diesel retrofit applications. This technology, which is being used in combination with a DPF for Level 3 PM control is also being demonstrated and commercialized for a variety of non-road applications, including heavy-duty earthmoving equipment, locomotives, agricultural pumps, and portable engines.

CONCLUSION

In closing, MECA believes that there are proven diesel exhaust emission control technologies including high efficiency, diesel particulate filters, partial filter designs, DOCs, selective catalytic reduction technology and lean NOx catalysts that are available for achieving significant reductions in PM and NOx emissions from future new and in-use stationary agricultural diesel engines. Our industry has successfully provided cost-effective emissions control technologies for over 25 years and will continue to work with engine manufacturers on new "clean diesel" engines and to develop, manufacture, sell, and service verified diesel retrofit technologies for in-use diesel engines.

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