UREA SELECTIVE CATALYTIC REDUCTION AND DIESEL PARTICULATE FILTER SYSTEM FOR DIESEL LIGHT-DUTY TRUCK/SPORT UTILITY VEHICLE MEETING TIER II BIN 5

Robert Hammerle and Christine Lambert

Ford Research & Advanced Engineering

Mike Noorman

ExxonMobil Research & Engineering

ABSTRACT

Ford Motor Company is participating in the U.S. Department of Energy's (DOE) Ultra-Clean Transportation Fuels Program with the goal of developing an innovative emission-control system for diesel sport utility vehicles. This program focuses on diesel vehicles because in Europe they currently offer up to 50-percent better volumetric fuel economy and up to 25-percent lower CO_2 emissions than comparable gasoline vehicles. We are using selective catalytic reduction (SCR) with aqueous urea as the NO_x reductant and a catalyzed diesel particulate filter (DPF) for this program. We plan to demonstrate more than 90-percent reduction in particulate matter (PM) and NO_x emissions on a light-duty truck/sport utility vehicle application. We are using very low sulfur diesel fuel (~15 ppm) to enable low PM emissions, reducing the fuel economy penalty due to the emission control system, and improving long-term durability of the system. The end result will allow vehicles with diesel engines to be Tier II emissions certified at a minimum cost to the consumer.

In the second year of the program, we switched from an ultra low sulfur Swedish-style fuel to a low sulfur fuel developed by ExxonMobil that has properties reflective of those projected for 2007 U.S. diesel fuel. Recalibration of the engine was necessary to compensate for increases in NO_x and hydrocarbon emissions. We continued to separately improve the durability of both the urea SCR and DPF systems. We also have been improving exhaust gas NO_x and ammonia sensors for more accurate control of reductant injection and on-board diagnostics. Finally, we worked with nozzle and dispenser manufacturers to develop durable hardware for delivery of diesel fuel and aqueous urea simultaneously to the vehicle.