# Overview



This, the 6th Diesel Engine Emissions Reduction Workshop, was the best ever in this series of Workshops! The summary below shows why we say this:

- We were again fortunate to have the top investigators in the field of diesel in-cylinder combustion and emissions reduction as well as aftertreatment.
- Health effects experts brought us up to date on air quality effects on humans.
- We had a ride-and-drive in Dodge Durangos equipped with the Light Truck Clean Diesel Engines being developed at Cummins and DDC. These engines are very competitive with gasoline engines of similar power rating in terms of noise, vibration, and harshness (NVH), and performance. The major differences from the gasoline engines is that these diesel engines will get about 60 percent better city/highway mileage than gasoline engines while providing at least twice the improvement in engine life and half the carbon dioxide ($CO_2$) green-house gas.
- We heard that global warming is becoming more likely than had been previously realized. The potential "show stopper" preventing greater use of diesel engines in light truck and automotive applications is reducing harmful diesel emissions.
- Vehicle manufacturers apparently are requiring a demonstration of at least the feasibility of meeting Tier 2 Standards before committing to an engine for a production vehicle. Thus, reducing diesel engine emissions takes on further increased importance.
- We heard Pat Flynn of Cummins tell us about the theoretical limits of in-cylinder $NO_x$ reduction, and other investigators tell us what they have achieved with computer-controlled fuel injection and cooled exhaust gas recirculation (EGR) together.
- Key investigators reported on $NO_x$ reduction aftertreatment. They told us that variants of urea systems, $NO_x$ adsorber catalysts, and non-thermal plasmas are the leading candidates showing feasibility but need major work to turn them into commercially available products.
- According to two major manufacturers of particulate traps, particulates can be reduced to Tier 2 levels with their latest products. They still have problems regenerating or oxidizing the trapped carbon due to exhaust temperatures not meeting the threshold temperature for regeneration for several operating conditions of the engines, according to diesel engine company speakers.
- The problem of sulfur in diesel fuel and its effects on particulate emissions and on aftertreatment devices/systems were ably reported by the Diesel Emissions Control - Sulfur Effects (DECSE) program representative. The bottom line: sulfur levels in diesel fuel should be somewhere between 0 and 15 parts per million (ppm).
- Since 0 ppm sulfur fuel does not appear economically viable at this point in time, there were papers describing sulfur traps.
- The emerging $NO_x$ adsorber catalysts are significantly degraded by sulfur and will require either 0 ppm sulfur or a trap with low-sulfur fuel.
- We had our second panel session with the part of the environmental community concerned about diesel engine exhaust as related to human health effects. They are very concerned about the dirty diesels. Diesel engines as clean as gasoline engines would be acceptable, but they would want them introduced into the marketplace soon in order to replace rapidly the existing fleet, with the worst emitters being replaced first.
- Speakers talked about the engine companies having to develop appropriate technology within acceptable initial capital costs, device

operational degradation, warranty and replacement/refurbishing costs, and R&D expenditures to develop the technology.

The authors are to be congratulated for their outstanding papers, and we acknowledge these considerable efforts. Particular appreciation goes to the teams from DDC and Cummins who brought their new clean diesel engines out to San Diego for a demonstration ride-and-drive at this Workshop.

The California Energy Commission (CEC) helped considerably in providing the California perspective on emissions and their game plan for improving air quality. They arranged for the top management of CEC, the California Air Resources Board, the South Coast Air Quality Management District, and several other organizations to make presentations.

The DOE Oak Ridge Institute for Science and Education (ORISE) staff managed all the administrative and logistical effort and did an excellent job with all that entails. We would like to thank Andreene Witt and Julie Malicoat especially. Thanks also to a DEER "plank owner" Greg Gregory, who will put together the Proceedings of this year's Workshop as he has for the other five DEER Workshops. Also, thanks to Terry Levinson of Argonne National Laboratory for being a good sounding board and offering many worthwhile suggestions. Last, but not least, we appreciate Jim Eberhardt's strong support for the DEER series and allowing an unfettered freedom to organize and implement these Workshops.

We are planning to hold the 7th DEER Workshop, tentatively August 6-10, 2001, in Portsmouth, Virginia.

John W. Fairbanks,
Chairman - DEER Workshop Series