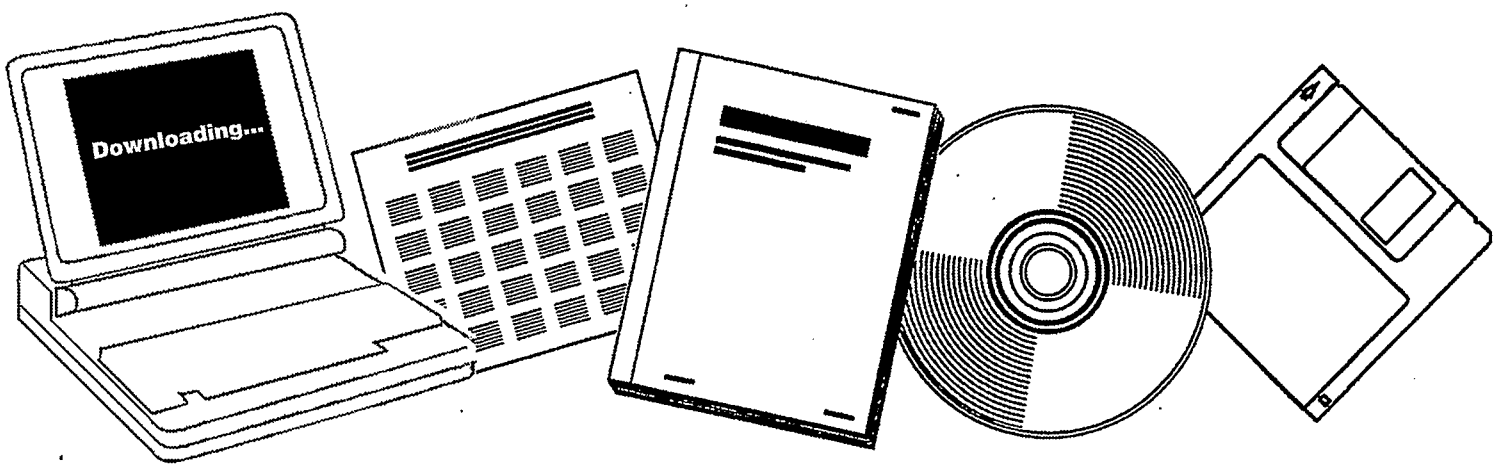
PROCEEDINGS OF THE 1998 DIESEL ENGINE EMISSIONS REDUCTION WORKSHOP. HELD IN CASTINE, MAINE ON JULY 6-9, 1998

MAINE MARITIME ACADEMY, CASTINE

31 DEC 1998



Proceedings of the

1998 Diesel Engine Emissions Reduction Workshop

Maine Maritime Academy
Castine, Maine
July 6-9, 1998

Sponsored by:

U.S. Department of Energy
Office of Transportation Technologies
Assistant Secretary for Energy Efficiency and Renewable Energy

DOE/EE-0191

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1998 DIESEL ENGINE EMISSIONS REDUCTION WORKSHOP

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SESSION IV: Fuels and Lubrication Technologies

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Department of Energy

Washington, DC 20585

Chairman's Overview DEER '98 Proceedings

CHAIRMAN'S OVERVIEW

This workshop was very timely with respect to the increasing activity of the anti-diesel critics whose positions appear to be sincere but based more on emotion than science. Their emotional base is doubtless influenced by the plumes of black smoke emitted from old diesel engines powering buses and trucks during accelerations and the associated diesel odor. Ironically, it is the tail pipe emissions that are undetectable by the human eye that are the human health concern from both diesel and gasoline engines. Recent measurements of ultra-fine particulate, i.e. particulate with a diameter of 0.10 microns or less, suggest that some of the efforts that reduced particulate mass have significantly increased the number of ultra-fines. Data from the AEA in the UK, who are at the forefront in ultra-fine particulate measurement technology, indicates that cars with gasoline engines and catalytic converters emit at least ,if not more, ultra-fine particulate than comparable diesel engine powered cars on the highway. The smaller the inhaled particulate, the greater the probability of deposition in the lung or possibly passing through the lung tissue and entering the bloodstream, eventually depositing in various parts of the body possibly resulting in adverse health effects. The session on Human Health Effects was organized to present what is known and what is not known about the effects of ultra-fine particulate and to enhance communication between the health effects experts and the diesel engine community. The more difficult challenge for the diesel engine manufacturers is to reduce the oxides of nitrogen (NO) with a minimal fuel economy penalty. Non-thermal plasma devices papers indicate progress on NO reduction with devices that should simultaneously reduce particulate. NO reducing catalysts with periodic rich burn were shown to be very effective but only with zero or very low sulfur levels in the diesel fuel. Field testing results with the catalytic soot filter were impressive. New ideas such as MIT's plasmatron, which treats fuel before combustion, indicated intriguing results with gasoline suggesting further work with diesel fuel. Advanced methods for exhaust gas energy utilization involving quantum well thermoelectrics with 30 % conversion efficiency, compared to 6% with state-of-the art bulk semi-conductor devices and motor/alternators attached to the turbocharger shaft with a similar motor/alternators on the engine replacing the conventional alternator and starter were presented. The later system allows the turbocharger to be motorized for starting and acceleration minimizing turbo-lag emissions.

If there is an effect on global climate warming from transportation, the replacement of a gasoline engine with a diesel engine on a light truck will reduce the carbon dioxide (CO_2) emission by about 50% and essentially eliminate the nitrous oxides (N_2O) which comes from the 3-way catalysts on gasoline engines on autos. The N_2O molecule has over 300 times the greenhouse effect as a CO_2 molecule.

The major DEER '98 Workshop objectives of bringing together key people representing their agency or organization involved with diesel engines to present timely papers coupled with follow-up discussions. Based on unsolicited comments by participants, this Workshop was the considered the most successful of the DEER Workshop series! Jim Wright, of ORISE deserves credit for the excellent handling of the administrative aspects of this Workshop. We are very appreciative of the support of Len Tyler, President of Maine Maritime Academy, in making the facilities including the boats available for the Workshop. Then there were the "lob-stahs" that contributed their all to making this a particularly enjoyable event . There will very probably be a DEER '99 in Castine, Maine .

John Fairbanks

John Fairbanks, Chairman
Diesel Engine Emissions Reduction '98 Workshop