LATE-CYCLE INJECTION OF AIR / OXYGEN-ENRICHED AIR TO REDUCE DIESEL EXHAUST EMISSIONS

Daniel Mather
University of Wisconsin ERC

The long time challenge for diesel engine manufacturers has been to reduce both particulate and NO_x emissions simultaneously. By injecting air or oxygen-enriched air directly into the combustion chamber late in the combustion cycle, particulate emissions can be reduced. Additionally, by combining this technique with optimized fuel injection characteristics, both NO_x and particulates can be reduced simultaneously. A CRADA program between Argonne National Laboratory and Caterpillar Inc. has been researching this innovative technique for reducing diesel engine exhaust emissions.

Extensive analytical studies using the KIVA-3 computational fluid dynamics (CFD) model developed at the University of Wisconsin have been conducted. These studies have shown the importance of the gas injection characteristics on the technique's effectiveness in reducing emissions. They have additionally shown a simultaneous reduction of NO_x and particulates when the fuel injection characteristics are optimized in conjunction with late cycle air injection. The analytical results are now in the process of being verified with experimental data from a Caterpillar 3401E single cylinder research engine at Argonne.