

STATE-OF-THE-ART AND EMERGING TRUCK ENGINE TECHNOLOGIES FOR OPTIMIZED PERFORMANCE, EMISSIONS, AND LIFE-CYCLE COSTING

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ABSTRACT

The challenge for truck engine product engineering is and will be not only to fulfill increasingly stringent emission requirements, but also to maintain or improve the engine's economical viability as the powerplant that is the backbone of our economy. As emission limit values are to be reduced in big steps, continuous improvement is not enough but technological quantum leaps are necessary. In the past, the introduction and refinement of electronic control of all major engine functions have been such a quantum leap required to make full use of parameter optimization.

The next big step forward will be exhaust after-treatment, which is successfully established since many years on Otto-cycle engines. The introduction of exhaust aftertreatment especially for diesel engines for commercial vehicles is a much more demanding task, but the limit values to be met starting in the 2005-2007 timeframe in Europe, the U.S.A., and Japan require this step and the engine industry is able to implement the new technology if all stakeholders support the necessary decisions.

One decision has already been taken: the reduction of sulfur in diesel fuel. This is comparable to the elimination of lead in gasoline as a prerequisite for the three-way catalyst. Now we have the chance to optimize ecology and economy of the diesel engine simultaneously by taking the decision to provide an additional infrastructure for a NO_x reduction agent needed for the introduction of the selective catalytic reduction technology, which is already implemented in electric power generation. This requires some effort, but the costs are significantly below the gains in fuel efficiency in comparison to other technologies. After long discussions, this decision has been taken in Europe and is supported by all truck and engine manufacturers. The necessary logistic support will be in place when it will be needed in 2005.

For the United States, the decision has to be taken this year in order to have the infrastructure available in 2007. It will enable the global engine industry to focus their R & D budgets on one direction not only for 2007 but for the years beyond 2010 with the best benefit for the environment, the customers, and the industry.