NON-THERMAL PLASMA BASED TECHNOLOGIES FOR THE AFTERTREATMENT OF AUTOMOTIVE EXHAUST PARTICULATES AND MARINE DIESEL EXHAUST NO_X

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ABSTRACT

The trend in environmental legislation is such that primary engine modifications will not be sufficient to meet all future emissions requirements, and exhaust aftertreatment technologies will need to be employed. One potential solution that is well placed to meet those requirements is non-thermal plasma technology. This paper will describe our work with some of our partners in the development of a plasma-based diesel particulate filter (DPF) and plasma-assisted catalytic reduction for NO_x removal.

Accentus and Eberspächer have been working to develop non-thermal plasma regenerated DPF technology for diesel passenger car applications. The results from the evaluation of a prototype system on a 3.0L diesel engine with Euro IV engine management will be presented. During the evaluation, filtration efficiencies between 95 and 100 percent were recorded with plasma regeneration demonstrated at powers down to 600 W at a range of exhaust gas temperatures. The evaluation also demonstrates the possibility for a flexible control strategy, which could be based around either continuous or intermittent regeneration.

The U.K. Ministry of Defence (Navy) is evaluating the feasibility of exhaust control technologies suitable for the reduction of NO_x emissions from diesel engines. The plasma - assisted catalysis approach can offer a number of potential advantages over the use of selective catalytic reduction in a warship application, such as low-load performance and the removal of the need for a urea-based reductant. A development program is underway to produce a plasma-assisted catalytic reduction system for NO_x removal. This program has been based on understanding the process at the laboratory scale and then undertaking the design, build, and testing of a system to treat $1/10^{th}$ the flow from a 1.4 MW marine diesel engine. The overall strategy for the program will be described together with results from the programme to date, including the initial testing of the $1/10^{th}$ scale system.