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Diesel Aftertreatment Systems: 2004-2007, A Cost Assessment

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Diesel Aftertreatment Systems: 2004-2007, A Cost Assessment.

Abstract:

This study assesses the exhaust aftertreatment technologies, and the costs thereof, required to achieve future emissions legislation.

Firstly, a brief summary of the types of systems is addressed with a cost of implementation implicitly attached to each system of choice. The three major routes considered to meet the various legislated limits are: a diesel particulate filter coupled with EGR (exhaust gas recirculation), a selective catalytic reduction (SCR) system based on urea, and a combination of both a filter and SCR. The systems are reviewed with an emphasis on emissions reduction potential as well as possible diesel fuel savings where applicable.

Secondly, the cost implications of using a secondary, water-based fuel (urea) on board diesel vehicles as a basis for NO_x reduction via a simple discounted cash flow methodology are explored. By utilising the methodology described, various parameters such as fuel costs (both diesel and urea), annual mileage, fuel economy, and system cost can be varied and examined in detail. The 'system' costs are calculated throughout the vehicle life, within a practical framework, in order to assess the feasibility of implementing these advanced aftertreatment systems in the future.

Other issues that are briefly considered include quantities of urea predicted to meet the needs of the systems, urea fuel storage and delivery aspects, and potential increase in urea production.

Introduction

The most recent changes within the Federal emissions legislation will be very demanding for heavy duty diesel vehicles as outlined in Table 1. Both the NO_x and PM (nitrogen oxides and particle matter, respectively) standards for the year 2004 are severe, with NO_x in particular eventually being lowered to a value lower than that proposed in Europe. Note that these values cannot be compared directly as different testing cycles are utilised in Europe and the United States. Despite the differences in the US heavy duty transient test and the European transient test cycles,

(ORO 47930)