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Title

Reduction of particulate emissions in compression ignition engines

Abstract

This literature survey concentrates on emissions of particulate matter (PM) from compression ignition diesel engines. The formation and structure of diesel PM is described. The diesel particle typically has a carbon core that is surrounded by heavy hydrocarbons, sulphuric compounds, water, and metal oxides. Under certain circumstances, droplets of sulphuric acid, hydrocarbons and water may also exist as particulates in the exhaust.

Methods of reducing PM emissions are divided into three categories: engine in-cylinder measures, fuel properties and after-treatment devices. In-cylinder measures include topics such as controlling the fuel-air mixture, turbocharging, lubrication, and exhaust gas recirculation. Alternative combustion processes for compression ignition engines are also discussed. The effects of both regular diesel fuels and various alternative fuels on PM emissions are presented. In after-treatment techniques, the emphasis of the study is on diesel particulate filters.

In this study, current and future emission regulations for diesel PM emissions in different applications are presented briefly. Possible measures for fulfilling future emission regulations are assessed in the conclusion. It is also discussed which PM reduction technologies of high-speed engines could be applied to medium- and low-speed engines.

Keywords and classification

diesel engine, particulate matter, emission reduction, alternative fuels

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