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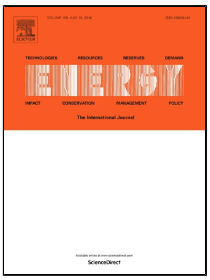

Experimental study on the durability of biodiesel-powered engine equipped with a diesel oxidation catalyst and a selective catalytic reduction system

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ABSTRACT

This study aims to investigate the effect of durability on the regulated and unregulated emissions, as well as the power and fuel economy performance of a biodiesel-powered engine equipped with a diesel oxidation catalyst (DOC) and a selective catalytic reduction (SCR) system based on a 500-hours durability test. Furthermore, a BET (Brunauer-Emmett-Teller) test was employed to analyze the specific surface area changes of the DOC and SCR. Results show that after the durability, the power performance improved and the brake-specific fuel consumption (BSFC) reduced due to the running-in effect. Although the deterioration of the DOC and SCR after the durability resulted in an increase in the carbon monoxide (CO), total hydrocarbon (THC) and nitrogen oxide (NO_X) emission factors of the biodiesel-powered engine based on European steady state cycle (ESC) by 41.3%, 36.1% and 39.2%, respectively, these emissions were still below China-Ⅴ limits. For unregulated emissions, the reduced BSFC caused by the durability led to a decrease in the carbon dioxide (CO_2) and sulfur dioxide (SO_2) emissions, but the durability resulted in higher aldehyde emission. The BET specific surface areas of the DOC and SCR decreased by 40.2% and 35.0%, respectively after the durability, which accounted for their catalytic performance deterioration.

Keywords: Biodiesel-powered engine; Durability; DOC; SCR; Emissions

1 Introduction

Issues such as depletion of fossil energy, growing global warming and increasingly stringent emission regulations have accentuated the public and scientific awareness and led to a substantial effort to develop alternative