

THE EFFECT OF LOW-CARBON FUEL ON TRACE METALS, ORGANIC COMPOUNDS, GASEOUS AND PARTICULATE SPECIES FROM A EURO IV DIESEL ENGINE AT STEADY-STATE MODE

ABDULFATAH ABDU YUSUF & Professor FREDDIE L. INAMBAO

Department of Mechanical Engineering, University of KwaZulu-Natal, Durban 4041, Republic of South Africa

ABSTRACT

Diesel engines are a source of heavy pollutants which are of particular concern. If strict measures are not taken, pollutants will continue to grow at a fast rate due to the massive increase in energy use via the transport system. Bearing this in mind, the effects of emitted carbonaceous, tracer metal, gaseous and ultra-fine pollutants from a Euro IV diesel engine operated with biodiesel blend fuel were investigated in steady-state operating conditions. The baseline fuel was BC00 and the corresponding observations were recorded as a benchmark. With an increase in biodiesel, the experimental results showed an increase in aliphatic compounds, and a reduction in carbonaceous species and aromatic compounds, which can be explained due to the low amount of total PM_{2.5} mass present. CO and HC emissions were found to be within the Euro V emission limit, except for diesel and BC05 emissions. The emission of NO_x and smoke significantly decreased across all biodiesel blends, which might be due to the occurrence of bonded oxygen with the absence of aromatics in the blend fuels which resulted in a reduction of soot nuclei formation, mainly in localized rich zones. However, some species such as zinc (Zn), calcium (Ca), sodium (Na), phosphorus (P) and vanadium (V) possibly remained in the diesel and could eventually be emitted as particles. Even though a proportion of the particles can be removed from the fuel via pre-heating, filtration or centrifuging, some may remain in the combustion air. It is often necessary to improve such unstable fuel by mixing it with a biodegradable fuel.

KEYWORDS: Diesel Engine; Trace Metals; Soot and Gaseous Particles; Organic Compounds & Biodiesel

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