Abstract

In order to slow down the continuing environmental deterioration, regulations for pollutant emissions limitations are increasingly rigorous. The development of new alternative fuels for internal combustion engines is a very interesting solution not only to overcome the pollution problem but also because of the petroleum shortage. In this context, the present work investigates the improvement of a DI diesel engine operating at constant speed (1500 rpm) and under dual fuel mode with eucalyptus biodiesel and natural gas (NG) enriched by various H_2 quantities (15, 25 and 30 by v%). The eucalyptus biodiesel quantity injected into the engine cylinder is kept constant, to supply around 10% of the engine nominal power, for all examined engine loads. The engine load is further increased using only the gaseous fuel (NG+H_2), which is introduced with the intake air. The effect of H_2/NG blending ratio on the combustion parameters, performance and pollutant emissions of the engine is investigated and compared with those of pure NG case. An important benefit in terms of brake specific fuel consumption, reaching a decrease of 4–10% with the 25% H_2 blend compared to the pure NG case, is achieved. Concerning the pollutant emissions, NG enrichment with H_2 is an efficient solution to enhance the combustion process and hence reduce carbon monoxide, unburned hydrocarbon and soot emissions at high loads where they are important for pure NG. However for the nitrogen oxide emissions, NG blending with H_2 is attractive only at low and medium loads where their levels are lower than pure NG.