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EFFICIENCY AND CO_2 EMISSION OF HEAT ENGINES OPERATING WITH HYDROGEN RICH GAS (HRG) ADDITION

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Abstract

The effects of gas addition on efficiency and CO_2 emission were investigated with a compression ignition (CI) engine and a spark ignition (SI) engine operating with hydrocarbons-based fuels. Hydrogen rich gas (HRG) provided by an electrolyze, was aspirated into the air stream inducted in the engine cylinders. Investigation was conducted at engine light and medium loads and speeds, with relative low concentrations of HRG. For the CI engine, HRG addition up to 12.5% energetic fraction in fuel lowered CO_2 concentration (ppm) in the engine exhaust up to 8% and BTE up to 1%. CO_2 specific emission (g/kWh) was correspondingly lower with maximum 10%. For the SI engine fueled with gasoline, the effect of HRG addition was depending not only on engine load and speed, but also on the relative air-fuel ratio λ. It was found for CO_2 concentration a maximum decrease of 5% by HRG addition. BTE was improved in a limited domain of HRG fraction up to 20%, with maximum improvements between 2.5% and 21%. As a cumulative effect on CO_2 concentration an on BTE a maximum lowering by 30% of the CO_2 specific emission was reached. The effect of HRG supplementing LPG gas in the same SI engine was alternatively studied with similar results: CO_2 concentration reductions by maximum 3%, some possible improvements of BTE up to 33% at HRG fraction of 19% and finally a lowering of CO_2 specific emission by maximum 37%.

Key words: HRG, diesel engine, SI engine, CO_2 emission, BTE

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