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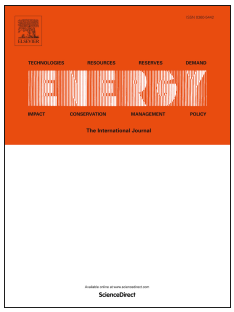

Asymmetric twin-scroll turbocharging in diesel engines for energy and emission improvement

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Asymmetric Twin-scroll Turbocharging in Diesel Engines for Energy and Emission Improvement

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Abstract

Turbocharging is widely used in all types of diesel engines to improve power, fuel economy, and emissions. The asymmetric twin-scroll turbine is a new technology that is relatively simple and can effectively solve the contradiction between low nitrogen oxide (NO_x) emissions and low fuel consumption when exhaust gas recirculation (EGR) is employed. However, it's a challenge to achieve a good match between an asymmetric twin-scroll turbine and a diesel engine. In this study, an experimental investigation was performed to calibrate the numerical model of a turbocharging diesel engine. Based on the model, the effects of key parameters, including turbine scroll asymmetry (ASY, the ratio of the throat areas of the two scrolls), throat area and efficiency, on the engine power, fuel economy, and emissions are studied. The EGR rate at the maximum torque point and BSFC at the rated power point decrease by 1.57% and 0.09%, respectively, when ASY increases by 1%. When throat area grows by 1%, the EGR rate at the maximum torque point and BSFC at the rated power point could reduce by 0.91% and 0.12%, respectively. The efficiency growth of 1% results in BSFC at the rated power point and the EGR rate at the maximum torque possibly decreasing by

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