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Dynamical performance analysis of hybrid vehicle based on turbocharger derivative micro gas turbine engine

Moin U Ahmed[1], M R Hasan[1], Eldad J Avital[1] and T Korakianitis[1,2]
[1]Queen Mary University of London, UK
[2]Saint Louis University, USA

Hybrid electric vehicle has been traditionally using piston engine as the power train. Recently, micro gas turbine engine has been promoted for exhibiting robust power-to-size ratio and multi-fuel capacity. However, its cost and off design efficiency remains a challenge till date. In this work, dynamical performance analysis of micro gas turbine based hybrid electric vehicle is presented. The work shows a complete design and off design performance of automotive turbocharger derivative micro gas turbine engine. The performance maps of the relevant engine are used to simulate vehicular dynamical performance. Computational models for various hybrid vehicle modes are presented. The models are based on one-dimensional quasi-steady dynamics and steady-state thermodynamics principles. A comparative analysis is presented for the relevant modes of vehicles, such as, engine driven only, series hybrid and parallel hybrid. Comparison between gas turbine and piston engine performance is also presented for different types of vehicles, such as, compact, medium and heavy. Results show that piston engine driven cars out-performs gas turbine ones when not in hybrid mode. It is also evident that gas turbines are suited for bigger hybrid vehicles, while piston engine dominate the compact ones. Extending this study to include transient powertrain thermodynamics can be a follow up step.

Biography

Moin U Ahmed has completed his ME in Aerospace Engineering in 2011 from the School of Engineering and Material Science at Queen Mary University of London. He is currently pursuing a PhD in Mechanical Engineering from the same instituition. During his Post-Graduate studies, he has been a Graduate Teaching Assistant in his school. His area of research interest are aerodynamics, gas turbine design and performance analysis, renewable and sustainable energy.

m.u.ahmed@qmul.ac.uk

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