Peter Bauer et al., J Fundam Renewable Energy App 2016, 6:6(Suppl)
http://dx.doi.org/10.4172/2090-4541.C1.020

Biodiesel versus diesel: A comparative analysis of the effect of engine cycling on efficiency

Peter Bauer[1] and **Jenny Murillo**[2]
[1]University of Notre Dame, USA
[2]University of Roviray Virgili, Spain

This paper provides an analysis of the efficiency gains/losses in diesel engines if mixtures of bio-diesel are used instead of regular diesel. While it is known that the attainable BSFC values with bio-diesel are always higher than in the case of regular diesel, it is entirely unclear whether engine cycling can still provide efficiency advantages, i.e. lower the overall BSFC value when bio-diesel is used as a fuel. The answer to this question solely lies in the shape of BSFC field, the minimum BSFC and its dependency on the power output of the engine. Moving from regular diesel to bio-diesel, not only the BSFC values change, but also the location of the global BSFC minimum. Based on our previous analysis, we will investigate the effects of cycling on engine efficiency in the case of biodiesel. In particular, we will provide conditions that determine whether cycling is advantageous. This is done by defining a cycling induced BSFC, a BSFC that is associated with an average power level that is achieved via cycling between two operating points. Of particular importance are the following questions: (a) if cycling was advantageous for regular diesel, will it always be advantageous if one switches to biodiesel, and (b) if cycling was not advantageous for regular diesel fuel, is it possible that switching to bio-diesel makes it advantageous. In addition to a theoretical analysis, this paper also provides some practical examples using the BSFC field of production engines.

Biography

Peter Bauer is a Professor at the Department of Electrical Engineering at the University of Notre Dame, IN. His research interests are control and optimization of hybrid drives and efficiency optimization of transportation in general.

Peter.H.Bauer.2@nd.edu

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