



A Study of the Use of Biodiesel Fuel in Internal Combustion Engines: Results from Engine Cycle Simulations

Junnian Zheng

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Based on the GT-Power software, an engine cycle simulation for a biodiesel fueled direct injection compression ignition engine has been developed and used to study its performance and emission characteristics. The major objectives are to establish the engine model for simulation and then apply the model to study the biodiesel fueled engine and compare it to a petroleum-fueled engine. The engine model has been developed corresponding to a 4.5 liter, John Deere 4045 four-cylinder diesel engine. Submodels for flow in intake/exhaust system, fuel injection, fuel vaporization and combustion, cylinder heat transfer, and energy transfer in a turbocharging system are combined with a thermodynamic analysis of the engine to yield instantaneous in-cylinder parameters and overall engine performance and emission characteristics. At selected operating conditions, effect of engine performance and emission on engine load/speed, injection timing/pressure, EGR level, and compression ratio have been investigated. Variations in cylinder pressure, ignition delay, bsfc, and nitric oxides emissions have been determined for both a biodiesel fueled engine and a conventional diesel fueled engine.

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