Theoretical simulation, manufacture and experimental evaluation of a free-piston Stirling engine electric generator

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Free-piston Stirling engines are external combustion heat engines. Pertaining to the renewable energy landscape, such engines are well suited for micro heat and power cogeneration, as they can be operated with concentrated solar power, bio-gas or methane combustion, or can be utilised as waste-heat recovery systems. To aid prospective engine designers with the development of such engines, in this study, a comprehensive theoretical simulation model of a free-piston Stirling engine electric generator was developed from first principles. To validate this model, an experimental engine prototype was designed, manufactured and tested. A good correlation between experimental measurements and modelled engine performance was achieved.