A Duplex Stirling Engine with Programmable Piston Positions

Submission is for research[1]

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An energy saving Duplex Stirling engine and heat pump boosted by solar energy has been modeled. The Stirling engine allows the use of any heat source to power the apparatus. Glass “dashpots” (Airpot Inc.) with close fitting ultra-low friction graphite pistons are used to avoid gas leaks and minimize friction over wide range of temperatures. The design features a heat pump directly coupled to the engine, saving space and significantly reducing the work input required during the unfavorable steps in the engine cycle. The Carnot cycle tells us that an engine running at 220^{o} C, with a heat sink at room temperature, must throw **at least** 59.4% of its energy input into that heat sink. Our coupled design also makes uses of the waste heat from the engine in order to heat the home. The design also features magnetic pistons which are driven by solenoid coils with a program dictating their motion. This allows steps which are truly isochoric; a significant advantage over most engines. The Schmidt and Carnot Cycles were used to calculate the advantage of isochoric steps over an engine using a conventional flywheel. This model predicts energy losses of 43% solely from use of the flywheel. By consolidating these features into a singular design, our model predicts a 64% reduction in heating costs and carbon footprint.

1. This project was funded by a Triad Interuniversity Project (TIP) grant as part of Four University Solar Consortium between Wake Forest University, Winston-Salem State University, NC A&T State University, and UNC Greensboro