Abstract

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Optimization of fin geometry of an exhaust heat exchanger for automotive thermoelectric generators.

Thermoelectric generators (TEGs) are the most eminent systems potentially identified to supply the increasing demand of electric power in contemporary passenger vehicles. These generators recover the iste heat of exhaust or/and engine coolant into electricity via Seebeck thermoelectric effect. One of the most important challenges in developing efficient TEGs is the design and optimization of the heat exchanger(s). We describe a computational methodology developed to optimize internally-finned tubular exhaust heat exchangers for this purpose. The optimization process is demonstrated through studying a novel heat exchanger concept. The pressure , Nusselt Number, and convection heat transfer coefficient were calculated for a geometry matrix representing fin length varying from 0.001 m to 0.02 m, and fin number of 5 to 35 fins. Three different exhaust flow rate, corresponding to engine cruise condition, were used in the analysis. The optimization algorithm and code are explained in details.