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# AIR FLOW ANALYSIS FOR TRIPLY PERIODIC MINIMAL SURFACE HEAT EXCHANGERS

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***Abstract*** – Due to the increasing popularity of additive manufacturing technologies, more varied and complex shapes of heat exchangers can be produced, that can be optimized to be more compact and efficient. In this paper a triply minimal periodic surface – gyroid structure – is designed to study the applicability of such structures in air-to-air heat exchangers used in residential ventilation recuperation systems. Gyroid surface structures are useful to decrease overall heat exchanger size, pressure and increase heat transfer. Several geometry variations with different flow rate values were analysed to compare the efficiency of heat exchanger designs, as well as basic counterflow plate heat exchanger arrangement was analysed, to compare the gyroid designs to conventional methods. To calculate the pressure difference, temperature and heat transfer in each variation, SolidWorks Flow Simulation was used. The results showed that by using gyroid structures, heat exchanger energy transfer can be optimised for required back pressure and heat transfer, while reducing the overall dimensions, compared to conventional heat exchangers. By incorporating low cost, printed thermal recuperators, thermal efficiency of residential buildings can be improved. Suitable materials, manufacturing methods and application limitations are discussed.

***Keywords – Additive manufacturing; CFD; gyroid; heat transfer; thermal recuperator***

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