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Optimization of Transient Heat Exchanger Performance for Improved Energy Efficiency GABRIELA BRAN ANLEU, PIROUZ KAVEHPOUR, ADRIENNE LAVINE, RICHARD WIRZ, University of California, Los Angeles — Heat exchangers are used in a multitude of applications within systems for energy generation, energy conversion, or energy storage. Many of these systems (e.g. solar power plants) function under transient conditions, but the design of the heat exchangers is typically optimized assuming steady state conditions. There is a potential for significant energy savings if the transient behavior of the heat exchanger is taken into account in designing the heat exchanger by optimizing its operating conditions in relation to the transient behavior of the overall system. The physics of the transient behavior of a heat exchanger needs to be understood to provide design parameters for transient heat exchangers to deliver energy savings. A numerical model was used to determine the optimized mass flow rates thermal properties for a thermal energy storage system. The transient behavior is strongly linked to the dimensionless parameters relating fluid properties, the mass flow rates, and the temperature of the fluids at the inlet of each stream. Smart metals, or advanced heat exchanger surface geometries and methods of construction will be used to meet the three goals mentioned before: 1) energy and cost reduction, 2) size reduction, and 3) optimal performance for all modes of operation.

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