



SCIENTIFIC & RESEARCH PROJECTS

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Project Field: Multi-Stream Heat Exchangers (MSHEs)

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Project Title:

Pressure Drop Optimization in Design of Multi-Stream Plate-Fin Heat Exchangers, Considering Variable Physical Properties

Abstract:

A modified method for the design of multi-stream plate-fin heat exchangers that considers variable physical properties is proposed in this paper. The new method, based on Pinch Technology, exploits the dependency of physical properties (heat capacity, viscosity, density and thermal conductivity) on temperature variations. A set of temperature correction factors based on variable physical properties is derived for the hot and cold streams of a multi-stream heat exchanger. This allows calculation of effective stream pressure drops, which can lead to a valid trade-off between operating and capital cost in the targeting stage. Accordingly, composite curves are constructed; based on the enthalpy intervals, the multi-stream heat exchanger is subdivided into a number of block sections. A plate-fin heat exchanger is then designed for each section by maximising the allowable effective pressure drops. Next, using a Genetic Algorithm, the method is completed in order to optimise the pressure drop of streams. Therefore, fin types for each individual stream are considered as optimising variables. By taking the variable physical properties of each stream into account and using the best fin selection, one can achieve accurate results in the design stage.