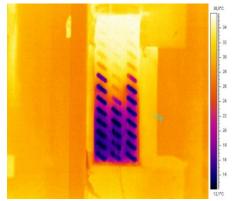# Passive control elements for intelligent flow control in heat exchangers

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Motivation: Heat exchangers are the most frequently used devices in energy and process engineering plants. Typically, one heat-emitting and one heat-absorbing fluid is involved and these are designed for a nominal load point with regard to flow rates and temperature level. In the partial load range, for example, the flow rates of the fluids can deviate significantly from the nominal load case, which typically leads to incorrect distributions and consequently poor efficiency of the apparatus.

Objective of the PhD project: The objective of this project is the design of valves and flow control elements based on the bimetal switch effect, which function as passive control elements inside heat exchangers and ensure an effective flow distribution of the fluids at different operating points. For this purpose, possible material combinations are to be identified which, with graded composition, allow a continuous controlled deformation of the component as a function of the component geometry and the adjacent temperature gradients. At first, these elements will be integrated

Flow maldistribution in tube-fin heat exchanger

in "shell and tube heat exchangers" and "plate heat exchangers". Later, this technic could be extended to passive controlled venturi nozzles and ejectors. This optimization leads to more precise flow distribution in different apparatus and a more efficient overall system.