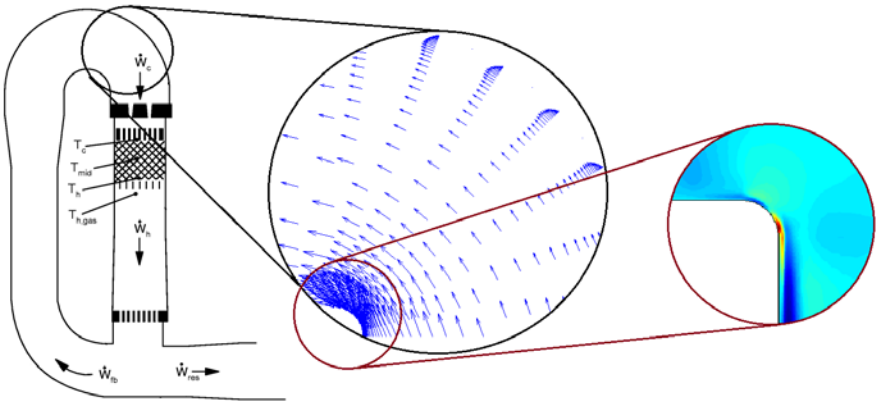
Optimization of thermoacoustic engine by means of CFD



Efficient usage of resources becomes more and more important because of their finiteness. One way to efficiently use energy, is micro combined heat and power generation (mCHP). Especially Stirling engines excited interest for the domestic use of mCHP in recent years. Despite the promise of high efficiency due to the underlying Stirling cycle, these engines often have reliability problems because of their numerous moving parts.

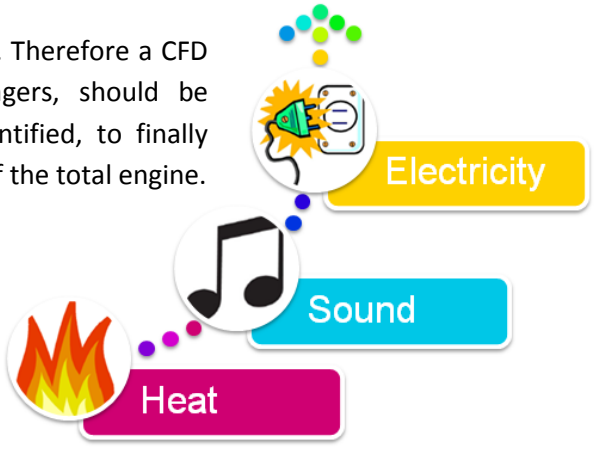
The novel heat engine under investigation makes use of an acoustic wave to perform a thermodynamic cycle similar to Stirling. This reduces the number of moving parts and leads therefore to a much higher reliability. Thus, we focus on the optimization of the novel engine for application within a mCHP appliance.

Master Assignment:

For the so called *traveling wave thermoacoustic engine* under investigation, the acoustic wave has to be looped. The goal of this assignment is to quantify and reduce the acoustic losses due to bends by means of CFD.

The assignment consists of a first part where a simplified CFD model is validated with help of a given analytical solution. Once this simplified model is validated, the loss mechanisms shall be quantified and design rules for an optimized geometry shall be derived.

In the second part the real engine geometry shall be optimized. Therefore a CFD model including nearby components, such as heat exchangers, should be developed. The mutual effects shall be investigated and quantified, to finally result in an optimized geometry and thus in a gain in efficiency of the total engine.



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