At the Institute for Combustion Engines (VKA) under the direction of Prof. Dr.-Ing. (USA) Stefan Pischinger, research on all topics concerning the vehicle powertrain is conducted. Core focus is still the research on conventional combustion engine development like the implementation of innovative engine designs, fundamental research on more efficient combustion processes also in combination with alternative fuels or the improvement of the engine mechanics and aftertreatment systems. Additional research areas include virtual engine development, hybrid powertrains, electromobility as well as fuel cells and mechatronics for combustion engines. At any time, research is closely associated with the ongoing development of intelligent methods for test procedures and engine calibration.

Master Thesis

Start: from now

☐ Faculty 1 - Mathematics, Computer Science and Natural Sciences
☒ Faculty 4 - Mechanical Engineering
☐ Faculty 6 - Electrical Engineering and Information Technology

Computational fluid dynamic simulation of electrical machine with rotor cooling

Performance and power density of electrical machines can be significantly increased by application of a rotor cooling system. Rotor cooling is already used in series electric vehicles traction drives. The thermal and fluid simulation of such a system is not trivial. In addition, the cooling capability is highly dependent on the according operating point of the electrical machine. In this master thesis, the complete electrical machine shall be simulated in CFD. The water jacket cooling, the internal air movement, as well as the rotor movement and rotor cooling have to be considered in the simulations. Temperature distributions, heat transfer coefficient to the coolants and to the internal air and windage loss are to be identified. Different operating points (e.g. different rotor speed, different heat input and different coolant flow rate) will be evaluated and the operating limits will be identified.

Your tasks / your profile:

• Set-up of CFD model (ANSYS Fluent) (geometry simplification, meshing, boundaries, rotation of rotor, cooling system)
• Evaluation of temperature, heat transfer coefficients and performance of the cooling system

Would you like to know more?

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