NAFEMS UK Regional Conference 2018 - Abstract Submission

Submission Date	2018-02-02 13:41:15
Name	Mrs. Leonie Upton
Job Title	Marketing Manager
Company	Siemens
Please identify the event for which your submitting?	NAFEMS UK Conference 2018
Will you be the presenting author?	No
Presenting Author	Mr. Markus Andres
Presenting Author Company	Siemens
Presenting Author Job Title	Manager
Presenting Author City, State/Province	Nuremburg Germany
Presentation Title	EV Drive-cycle Performance: Optimization and Thermal Analysis
Relevant Themes / Keywords	thermal, flow, optimisation, electromagnetic,thermal analysis

Abstract (plain text)	On the demand of getting more power, higher torque alongside with higher efficiency and low cost the optimization and thermal analysis of an electrical machine design is coming to the fore more and more. With the latest changes mainly due to governmental restrictions or demands and directions the automotive industry is forced to undergo significant changes towards the electrification of the vehicles. This change in electrification is recognized in the aerospace and marine industry as well. The intended presentation is showing for a mid-sized EV traction motor the design process in using modern state-of the art design tools. The design process takes into account the optimization of the machine using HEEDS in conjunction with SPEED, not only on a single load point but for a full drive cycle. The objectives hereby are: minimizing the material cost and maximizing the averaged efficiency over the load cycle. As the maximum torque is mostly limited by the maximum winding temperature which is dependent on the selected insulation class, it is essential to predict the temperature and keep it below the limits of the corresponding insulation class which is also influencing the cost of the machine. The initial design of the machine and its required torque is done by using our SPEED™ software an analytical tool supported by electromagnetic 2D FE analysis. From those calculations we can derive the losses in the active material parts, such as copper, magnets and iron – which are itself temperature dependent. Additionally mechanical (bearings, windage and friction) losses can be analytical estimated. By coupling STAR-CCM+® and SPEED, both flow/thermal and electromagnetic aspects can be tackled in the same working environment, resulting in a better, optimized design process. The thermal analysis of electric motors is a complicated process because of the multiple heat transfer paths within the motor and the different materials and thermal interfaces through which the heat must pass to be removed. A full 3D CHT analysis takes all the different heat transfer path directly in the electrical machine and its applied cooling system into account. The thermal analysis is carried out again for the whole drive cycle. Finally a Co-Simulation approach which decouples the time-scales of the fluids and the solid parts in the CHT calculation speeds up the simulation time significantly.
abstract id	UK18-45