

Design, Simulation and Optimization of Electric Machines for Green Vehicles

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As current sales reports are showing, the market for green vehicles is growing steadily. In order to persist in the global competition it is essential for car manufacturers to develop hybrid and electrical cars that perfectly match their customers' needs. Aspects like the daily driving range require different degrees of electrification and car concepts, which subsequently influence the choice of the most suitable type of electric machine. In hybrid cars, permanent magnet synchronous machines (PMSM) are used almost exclusively.

For the design optimization of PMSM a novel combination of a multi-objective particle swarm optimization algorithm and a Kriging metamodel was developed. This fast converging algorithm is used to solve the mostly conflicting objective functions which are based on computational expensive numerical field simulations. As an example the design optimization of a 10 poles PMSM with 11 parameters and 3 objectives is presented.