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Optimizing Electric Motors for Cars and Aircraft

Siemens Corporate Technology and partners are pursuing research projects aimed at improving the range and efficiency of electric motors.



The project Plug&Play Range Extender is examining how a module made of a small, fuel-efficient combustion engine and an alternator can increase the range of electric cars. In the project PELiKAn (a German acronym for the phrase "Power Electronics in Motor Vehicles and Aeronautics"), the aim is to use highly efficient power electronics to improve efficiency in aircraft and motor vehicles. Both projects are receiving support from the German Federal Ministry of Education and Research (BMBF).

As the electrification of aircraft and motor vehicles gains ground, factors like the efficiency, required installation space, and weight of individual components are playing a crucial role. Power transformers are key components for which ever higher switching frequencies are required. At present, the energy required for the activation of a power switch is lost, which limits the maximum efficiency to 95 percent.

The partners in the PELiKAn project are therefore working to develop compact and reliable voltage transformers with an efficiency of up to 99 percent. The aim is to achieve this level of efficiency with "regenerative drive circuits," which reduce the drive power needed by storing energy in a buffer. Researchers

also expect that new types of semiconductor materials, such as silicon carbide, and higher maximum operating temperatures will further reduce the switching losses and forward losses experienced by switches. Siemens is working on the three-year PELiKAn project with partners Daimler, EADS, Infineon, ZF Electronics, and the Fraunhofer Institute for Integrated Systems. The scientists of the global Siemens research department Corporate Technology are particularly focused on new switching concepts and on regulation and control technologies.

In the project Plug&Play Range Extender, the consortium of FEV, Siemens, Daimler, and the RWTH Aachen University will first define the requirements for a large-scale integrated Range Extender Module. In addition, marketable automotive designs will be drawn up. In a later phase, a vehicle with the Range Extender Module will then be built.