

ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

Variable Flux Permanent Magnet Machines for sustainable traction electrification

Funded by	Italian Ministry of University and Research and automotive company
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Context of the research activity	Design and control of variable-magnetization electrical machines, rare-earth free permanent magnet electrical machines for traction applications
Objectives	<p>Traction electrification is contributing to price surge and supply shortage of rare-earth permanent magnets (RE-PMs) such as NdFeB alloys. Their replacement with RE-free counterparts is an open challenge for electrical engineers and material scientists. New clean-earth magnets are under development, showing high-energy density but a low coercivity at high operating temperature.</p> <p>The PhD project deals with the design and control of a new type of PM motor for vehicular traction where the clean magnets can be magnetized and demagnetized via controlled current pulses during operation, to avoid unwilling demagnetization and take advantage of the additional degree of freedom of variable magnetization. The thesis will be developed in the design environment SyR-e, which includes routines for magnetic and structural FEA simulations besides design equations, optimization and e-drive control simulation.</p> <p>Start date: Nov 1, 2022. A minimum of 12 months of 36 will be spent abroad, in agreement with the industrial partner.</p>
Skills and competencies for the development of the activity	<p>Competences in electrical machines, power converters, power electronics and electric drives</p> <p>Experience of Finite-Element magnetic simulation</p> <p>Experience in real-time control of three-phase AC drives</p> <p>Programming skills (Matlab, Simulink, PLECS)</p> <p>Proficient technical writing in English</p> <p>Capability of autonomous and team work</p>