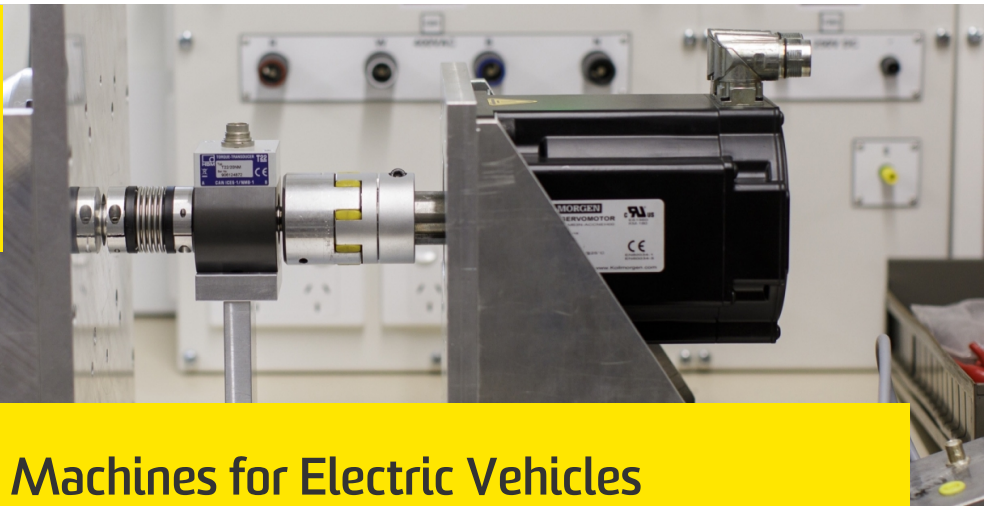




UNSW
SYDNEY



Permanent-Magnet Machines for Electric Vehicles

Expertise in designing and optimising various permanent-magnet (PM) machine geometries and electric drives, and in developing advanced control techniques to improve the performance of electric vehicles.

Competitive advantage

- World-class expertise in PM machine design and control, including wide-field weakening range
- One of the first in the world to develop mechanical sensorless control for an interior-type and a fractional-slot concentrated, wound interior PM machine
- Patented PM machine technologies with wide flux- weakening range and high-power density, and fractional-slot interior PM machines; patent application for novel multi-objective optimisation techniques for PM machines
- World's first experimental verification of fractional-slot concentrated wound stator with interior-type PM rotor

Impact

- Higher efficiency and better performance for EV-power trains
- Motors with wider constant power operation for traction applications

Successful applications

- Sensorless control techniques from zero to full speed for PM motor drives

Capabilities and facilities

- Finite-element packages, including Maxwell 2D/3D, Magsoft and ANSYS, with in-house optimization tools
- Simulation tools and platforms with Matlab-Simulink, and PSIM, FPGA and DSP systems with high-performance signal acquisition, estimation and switch gate-drive interfaces, to test and evaluate control techniques
- Two and three-level inverters
- Several machine drive set-ups complete with shaft position sensors, torque sensors and highly dynamic loads
- Four-quadrant dynamometer for testing direct-drive wind generators
- High-speed (>50 krpm) PM machine test bed (work-in-progress)

Our partners

- CSIRO
- Wisconsin Electric Machines and Power Electronics
- Toshiba
- Regal Beloit

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