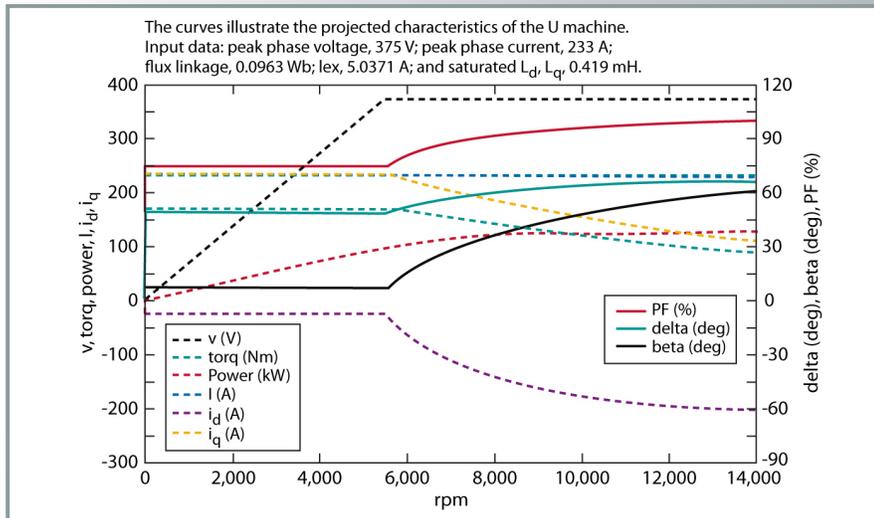


Substantially Parallel Flux Uncluttered Rotor Machines (U-Machine)

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Technology Summary

A U-machine invented at ORNL offers a new motor design that eliminates the need for a permanent magnet. Currently, permanent magnet motors are the choice for hybrid, plug-in, and fuel-cell vehicle drives. However, raw materials for permanent magnets (e.g., rare earth elements) are subject to trends in supply and demand; eliminating these materials from electric motors and generators helps to control component costs.

This invention shows potential to meet the DOE's 2020 motor targets for vehicle applications. The design has a greater peak motor speed than existing motor drives, it can reduce inverter loading for greater lifetime performance, and it retains strong starting torque. The machine is also lighter weight and has a smaller motor volume than permanent magnet motors.

This synchronous system has a stator core that generates a magnetic rotating field when sourced by an alternating current. It includes brushless adjustable field excitation for high starting torque, field weakening, and power factor improvement. The machine can operate at higher temperatures, with lower cooling costs, than conventional designs. There are also zip-locks that increase power density and reduce cost.

Advantages

- Increase in peak motor speed for drive motors, with reductions in cost, weight, and motor volume
- Lower cost
- Temperature advantages
- Mutual beneficial influences among the motor, power electronics, and cooling of the drive system
- Enhanced performance (e.g. strong starting torque)

Potential Applications

- Electric automotive propulsion
- Industrial motors and generators

Patent

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