



# UQM Technologies

Electric Motors & Machines

United States of America

www.uqm.com



## Electromagnetics Solution

### Overview

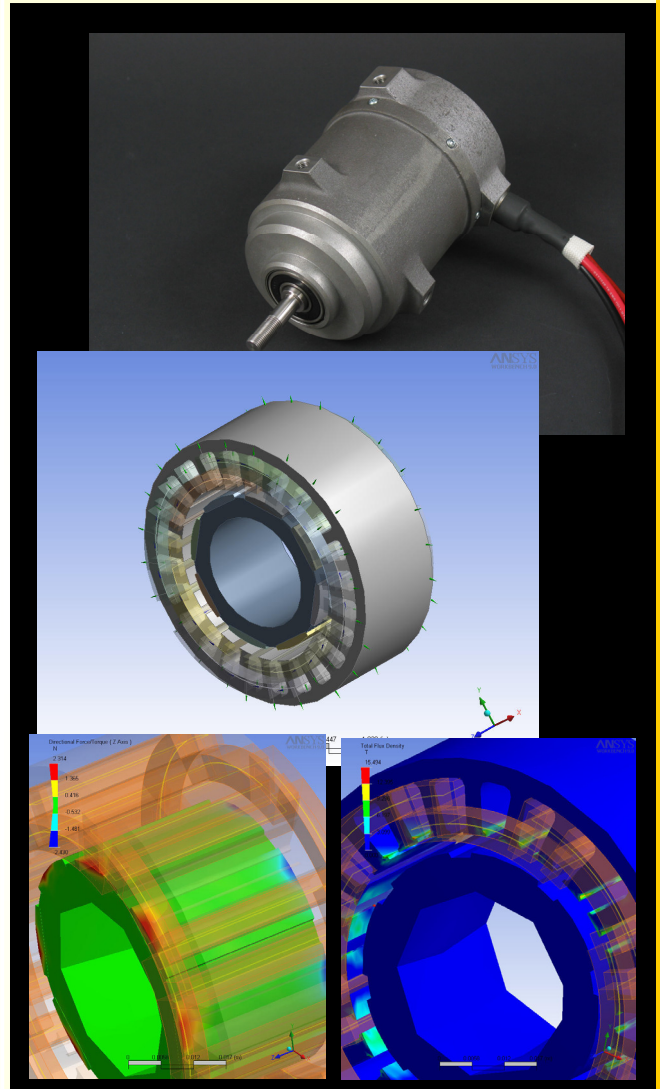
UQM is a developer and manufacturer of energy efficient, power dense electric motors, generators and power electronic controllers. UQM's primary focus is incorporating its advanced technology into products aimed at existing commercial markets for electrically propelled vehicles such as wheelchairs, golf carts and industrial utility vehicles. In addition, UQM is focused on as emerging markets expected to experience rapid growth including power systems for clean electric, hybrid electric and fuel cell electric on-road and off-road vehicles, vehicle auxiliaries configured to operate at 42-volts and environmentally friendly, distributed power generators. The company is also expanding efforts to develop systems for other applications that value efficient, compact and lightweight drive solutions.

UQM Technology has significant applications for electric propulsion systems, generators and power electronic controllers for electric, hybrid electric and fuel cell electric vehicles. Virtually all automobile and truck manufacturers worldwide are developing such vehicles. In the case of hybrid electric power plants, additional customers include Tier I and II automotive suppliers providing hybrid electric systems to their automotive customers.

### Testimonial

*"UQM Technologies uses ANSYS as an integral part of the motor design process, providing an accurate electromagnetic solution that easily integrated with other physics environments. UQM combines the electromagnetic, thermal and structural environments to perform comprehensive design and virtual prototyping methods, allowing us to meet tough application requirement for PM electric motors and generators. New features provided in the ANSYS Workbench™ and DesignModeler™ programs have added valuable design techniques to our process."*

**Josh Ley**  
Program Manager/Motor Design Engineer  
UQM Technologies



### Challenge

Modeling the inductance of a motor winding in 3-D is a challenge due to the complex geometric nature of a motor winding. However, 3-D FEA models can include the inductance effects of end-turns and other features that cannot be modeled properly in 2-D. The complex 3-D geometry of a winding motor must be easily modeled for quick turnaround.

### Solution

ANSYS Emag™ in Workbench was used to perform the inductance analysis. The complicated winding was easily generated using the new "winding tool" feature in DesignModeler. Model geometry creation and solution setup was quick and easy.

### Benefits

The benefit of this design procedure is more accurate winding inductance calculations that can be performed in Workbench 3-D nearly as easily as 2-D inductance calculations in ANSYS. Creating the winding with the winding tool saved valuable time from creating it as a solid model.