Pumping efficiency into electrical motors

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(Phys.org) —University of Adelaide researchers are using new magnetic materials to develop revolutionary electrical motors and generators which promise significant energy savings.

They have used the new motors to develop patented highly efficient water pump systems with potential widespread application.

"In the developed world, more than 50% of all energy generated is used by electrical motors," says lead researcher Associate Professor Nesimi Ertugrul, from the University's School of Electrical and Electronic Engineering. "This leaves a lot of room for efficiency gains."

"A significant portion of these motors are used to drive water pumps. They are invisible, but used everywhere – in pools, vehicles, boats, irrigation and industry. For example, large buildings have multiple water pumps and every swimming pool has at least one water pump which runs for several hours a day, consuming a large amount of electrical energy."

The University of Adelaide researchers have used two emerging magnetic materials – called soft magnetic composite (SMC) and amorphous magnetic material (AMM) – and two novel production techniques to form the 'stator' within the electrical motor or generator. The stator is the stationary and magnetic part of a motor surrounding the rotor which turns.

Both new techniques have been successfully developed and tested with small prototypes, showing substantial energy efficiency gains – up to

90% energy efficiency in small motors compared to 60-70% in conventional motors. The new motors are also smaller in size for a given power output.

"Currently all commercial motors are made by pressing very thin metal sheets of silicon iron together and then stamping out the shape of the stator from the metal," says Associate Professor Ertugrul. "This process is wasteful of the metal sheeting, and also limits the best use of available space for the copper wire needed in motors.

"We've produced new stators using SMC with no need for machining, no scrap metal and improved space utilisation for copper wire for greater power output."

Using SMC material and working with industry partner Intelligent Electric Motor Solutions (IEMS) Pty Ltd, the researchers have developed motors that operate at low speed with high power output and with low production costs, suitable for swimming pool and similar pumps.

The research teams have developed patented prototypes, using both technologies, and testing facilities and are now looking for further investment partners to commercialise the technology.

Provided by University of Adelaide

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