

'Future car' goes one-wheel drive

SPEEDS of more than 110 kilometres an hour, plus outstanding engine efficiency, have been generated by a permanent magnet motor that fits snugly into the front wheel of a solar-powered car.

Scientists from CSIRO Telecommunications and Industrial Physics, the University of Technology, Sydney, and Newcastle University, UK, designed the wheel motor for use in the 'Aurora' car at last year's Darwin-Adelaide Solar Challenge.

The wheel motor consists of a stationary armature disc (stator) encased in two outer rings of rotating supermagnets (rotors). The stator is made of finely-stranded wire (litz wire with about 400 strands) wound radially, and is fixed to the axle of the car. The supermagnets, which are fixed to the wheel, are made from the rare earth alloy neodymium-iron-boron.

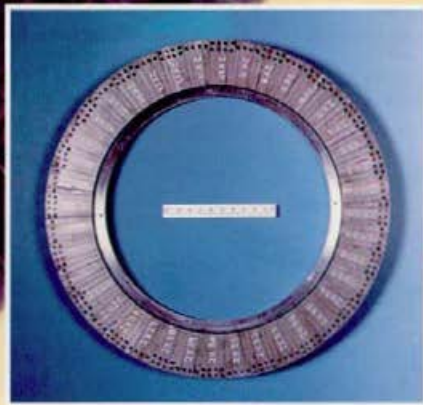
When electric current from the car's solar panels passes through the wire coil, a magnetic field is generated. This interacts with the magnetic field of the permanent magnets, causing them to rotate around the static, central disc.

An aluminium structure is used to give the lightest possible weight for the highest power output. The result is an engine which, when operating at 1000 watts, converts electrical to mechanical energy at 97.5% efficiency (compared with the usual 92-95% for a motor of similar output) and weighs only 8.3 kilograms, compared with the usual 12-16 kg.

One of the drawbacks of solar-electric travel is that the batteries and the motor take up a lot of space. But the wheel-motor enables a roomier ride. CSIRO's Dr Gerry Haddad says the motor could easily become the sort of power unit used in the vehicles of the 21st century.

The motor's magnets are made from rare-earth compounds and its structure from aluminium metal. Haddad says Australia is well placed to supply these raw materials and of the technology itself.

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The wheel motor consists of a stationary armature disc made of coiled wire (above) encased in outer rings of rotating magnets (left). Electric current passing through the coil generates a magnetic field that causes the magnets to rotate.