The **hydrogen technology** driving low-carbon transport

Fuel cell technology showcased in a hydrogen-powered canal barge proves that there will be "life after oil" and could help revolutionise transport. The 'Ross Barlow' uses a combination of a fuel cell, solid-state hydrogen storage, lead-acid batteries and a powerful electric motor.

Zero carbon emissions

from the hydrogen-powered 'Ross Barlow' canal barge.

The fuel cells are essentially gas-powered electric batteries. Hydrogen fed into the fuel cell is combined with oxygen from the air, which produces electricity and releases water.

The barge's fuel cell relies on a new material, a solid-state metal hydride, to store its hydrogen fuel. This material avoids the hazardous storage of compressed hydrogen. The barge has a conventional battery stack for additional power that can be recharged by the fuel cell. Both fuel cell and battery provide power for a very efficient electric motor based on powerful neodymium-iron-boron (NdFeB) magnets.

It was conceived by Professor Rex Harris of the University of Birmingham and developed in association with EPSRC's Sustainable Hydrogen Energy Consortium.

"The barge and its successors have great potential with regard to water-based transportation," explains Professor Harris. "Hydrogen will provide a zero-carbon fuel provided that 'green' electricity is employed to produce the hydrogen and to charge the batteries," he explains.

"The barge provides a very attractive showcase for hydrogen technology and for the use of high-energy NdFeB magnets in high efficiency electric motors and actuators," says Professor Harris. "There is an elegant link between these two areas since the hydrogen-based manufacturing process for the magnets was pioneered by my research group as part of a Research Council funded collaboration with Philips in the 1980s."

The hydrogen barge produces no smoky diesel exhaust fumes, which is important in urban regions and in the confines of a lock. Indeed, hot water is the only waste product and this can be used onboard, so maximising overall efficiency. The barge is also silent, which means no noise pollution affecting wildlife or people along the waterways.

"The hydrogen storage developments are part of an Anglo-Swiss project with EMPA Zurich and Andreas Zuttel's team," adds Professor Harris. Other partners include British Waterways, Advantage West Midlands, British Telecom, Less Common Metals, the Universities of Sheffield and Coventry, and TRW.

Now that the 'Ross Barlow' has proved itself, the next stage will be to create the necessary hydrogen generation and refuelling infrastructure throughout the waterways network and to develop bigger vessels. "British Waterways is clearly a vital partner in these developments," says Professor Harris.

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