



FUEL CELLS: A VIABLE ENERGY SOURCE?

Fuel cells and hydrogen-fuelled equipment are exciting new developments in a world seeking alternative energy sources. Fuel cells use platinum, a metal found in abundance in South Africa, the world's leading platinum producer.

While hydrogen can be used as a fuel in internal combustion engines, the more exciting option is fuel cells, which were first developed for travel in space. These cells use hydrogen to generate electricity for running an electric motor, with water as the by-product. They are eco-friendly and reduce harmful emissions.

According to Fahmida Smith, fuel cell coordinator at Implats' Refineries, fuel cells have a number of advantages over diesel as a power source. "Internal combustion engines that use diesel release carcinogenic diesel particulate matter (DPM). A hydrogen fuel cell system, on the other hand, releases only water. Even if a carbon-based methane-rich stream is used, which emits some carbon dioxide, it is significantly reduced. There may be extremely low levels of sulphur oxides and nitrogen oxides, but zero carbon monoxide and particulates. From a health and environmental perspective, this is a major improvement."

There are advantages to using fuel cells beyond environmental and health impacts. With fuel cell technology, the exit temperature at the fuel cell on a long-haul dump machine (LHD) is roughly half of that on a diesel vehicle, which reduces ventilation problems and excess heat. "Hydrogen fuel cells also offer excellent efficiency – for every kilowatt of energy you produce, an equivalent amount of heat is produced, and if you recover that heat it further lowers costs and the carbon footprint," says Smith.

While fuel cells are becoming more cost effective every year, they are still relatively expensive. However, Implats is of the view that the deployment and uptake of the technology will result in price decreases in fuel cell production. Smith says the current cost of capital is a challenge: "Fuel cells are following the same cost trajectory as solar power when the technology was initially deployed. The initial capital expenditure is high. However, as with all new technology, the cost of implementation decreases as deployment increases. If we look at the cost of the equipment when we first started this initiative a few years ago, we have already seen a reduction in capital cost of 15% to 20%."

Implats plans to use hydrogen fuel cell technology as its main source of energy for material handling and underground mining equipment. In March 2016 Implats, in partnership with the University of the Western Cape (UWC), unveiled its prototype hydrogen fuel cell forklift and refuelling station at the Impala Platinum Refineries in Springs, outside Johannesburg. The three-year project – the first of its kind in South Africa – was a collaboration between Impala

Platinum Refineries, Hydrogen South Africa (HySA) Systems, UWC and the Department of Science and Technology.

“We are looking at a wider industry collaboration to commercialise this. It is at a very early stage and we still need to develop a formal commercialisation strategy,” said Smith. Implats’ short- to medium-term plan foresees a future demand for stationary applications and niche mobile markets, such as materials handling and mining equipment, while its medium- to long-term plan predicts fuel cell electric vehicles will be the driving force behind future platinum demand.

Smith highlights the potential use of stationary fuel cells for off-grid power generation, and notes the technology can also be used for grid power and works well for distributed generation – the production of energy close to its point of use.

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