International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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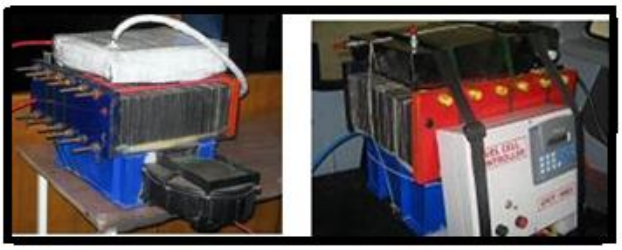
PEM Fuel cell powered materials handling devices

Overview

One of the major application domains that have emerged in recent years is the use PEM Fuel cells in materials handling devices such as forklifts. This industry is rapidly adopting fuel cells because of their life-cycle cost and productivity advantages over batteries. Hydrogen fuel cell-powered equipment needs refuelling once or twice daily, depending on use. Fuel cell provides consistent power strength during use and does not experience decreased performance unlike batteries which require battery change out or recharge time. The challenges include fabricating fuel cell stacks with high performance and small foot print/volume, developing a closed loop thermal management system to operate the fuel cell stacks for long duration, power electronic units which deliver constant voltage, and system integration and packaging so that the fuel cell system with all its BoP and hydrogen supply unit fits in the space available in the forklift.

Key Features

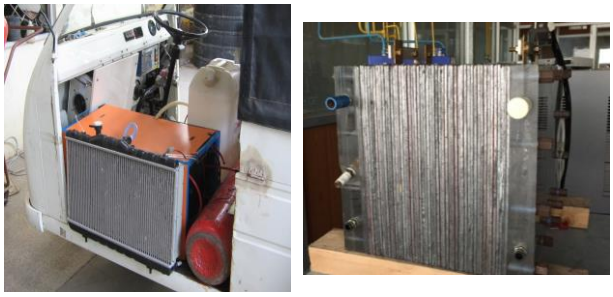
- Air cooled/ closed loop liquid cooled PEMFC stacks to be developed .
- PEMFC stacks with reduced weight and volume would be developed
- Control system development for the battery fuel cell hybrid system.
- PEMFC stack would operate optimum efficiency at variable operating loads.



1kW PEMFC stack with controller for vehicular applications

Potential Applications

- Application in material handling devices like Forklifts
- Application in recreational vehicles like Go Karts, Golf- Carts etc.
- Power source for all mobile applications.
- Power source for auxiliary units in mobile applications.



PEMFC stack with closed loop cooling and control system

Intellectual Property Development Indices (IPDI)

- Air cooled stacks of capacity 1kW developed.
- Liquid cooled stacks with close loop cooling developed for 5kW PEMFC power for vehicular applications

Status	1	2	3	4	5	6	7	8	9	10

Major Publications

1 .A Device for and A Method of Cooling Fuel Cells, K.S.Dhathathreyan, N. Rajalakshmi, B. Viswanath Sasank , Indian Patent Application no. 1409/DEL/2012

2. B.V. Sasank, N. Rajalakshmi and K.S. Dhathathreyan,"Design and Optimization of a Closed Two Loop Thermal Management Configuration for PEM Fuel Cell using Heat Transfer Modules", International Journal of Chemical Engineering and Applications, Vol. 3(3), p 243-248, 2012.

3. K. S. Dhathathreyan, N. Rajalakshmi, K. Jeyakumar and S. Pandiyan, "Forced Air Breathing PEMFC Stack", International Journal of Electrochemistry, Vol. 2012, Article ID 216494, 2012, doi:10.1155/2012/216494, 2012

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