ILLINOIS INSTITUTE OF TECHNOLOGY

Hybrid Electric Fuel Cell/Battery Transporter

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1. Summary of Project

This project is mainly concerned with creating a hybrid electric circuit to run a wheel chair for 100 miles. The hybrid circuit should function in such a manner that during operation the wheel chair should continuously drawing power from the fuel cell but should also take power from the lithium-ion batteries during peak power demands which the fuel cell cannot fully cover. Currently no such hybrid circuit exists but is being developed on a theoretical basis.

The current team that is working on this project has the following major objectives:

1) Create a charging circuit to charge the lithium-ion batteries using the output from the fuel cell.
2) Theoretically design a hybrid circuit partially using the charging circuit to charge the batteries.
3) Improve the battery design and perform thermal testing on the new design.
4) Investigate the economics and safety aspects of hydrogen use.
5) Examine the design of hydrogen production facilities.

2. Summary of Achievements / Plans

So far the team has had moderate success in fulfilling these objectives. Initially the team planned to perform an extended test drive with the wheel chair to test the designed charging circuit. Sadly two attempted drives both failed partly due to design flaws and partly due to difficulties starting the fuel cell. Currently a team is building a new charging circuit and tests will be performed on it shortly. As only a theoretical design will be made of the hybrid circuit a simulation of the hybrid system and circuitry is being created in MATLAB to test the design.

Currently an expensive aluminum foam form and a phase change material are being used as a passive cooling system for the lithium-ion cells. A team is looking into the potential use of carbon blocks and a phase change material to efficiently cool the cells. Multiple thermal tests are being performed on new passive cooling system to find an optimal design.

Further various safety aspects of hydrogen have been analyzed and summarized in a report available at http://www.iit.edu/~ipro304cs4. The wheel chair and trailer design is being updated to include these safety requirements. The team that is working on the design of hydrogen production facilities has made some significant progress so far and their intermediate results looking promising.