IPRO 318: Fuel Cells for the Future

Business or Bust?
Evaluate the feasibility of PEM fuel cells in commercial application

Investigate industrial and commercial technicalities of PEM fuel cells

Select an application and create a design incorporating a PEM fuel cell system into the chosen application.

Perform a cost and benefit analysis using engineering design principles.
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Fuel Cell Team Leader: Ellen Kloppenborg

Submersibles Team Leader: Josh Wilett

Team Leaders
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• Statement of Problem
• Organization of Team
• Goals of Project
• Progress toward Goals
• Major Obstacles and Resolutions
• Anticipated Challenges
• Questions
Goals of Project:
- Evaluate current PEM fuel cell technology
- Compare the performance and cost of fuel cell to internal combustion engines.
- Assess PBI fuel cell for use in UAV and UUV applications.
- Design a fuel cell system to power a UAV.
- Evaluate different fuels
- Compare the newly designed fuel cell system to existing propulsion systems.
PEM fuel cell not cost efficient for automobiles
  - Will concentrate on military applications.

Analyzed cost and performance of internal combustion engine

Fuel cell has the potential to be a replacement for battery power in both UUV’s and UAV’s
  - Decided to concentrate on UAVs due to airplanes’ ready access to oxygen

JP-5 and JP-8 fuels are the most worthy fuel candidates

Researching types of UAVs
IPRO
- Broad objective
- Wide spectrum of fuel cell designs available
- Emerging technology without mass market appeal

Fuel Cells
- Slow, inefficient start-up
- Limited operating temperatures
- Impurities reduce efficiency and lifetime

Resolutions
- Selected to design for unmanned aircraft
- Chose PBI instead of Nafion based PEM fuel cell

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- Selecting viable aircraft
- Optimizing in design:
  - Operating temperature
  - Size
  - Weight
- Resolving storage and delivery of fuel
- Making result economically competitive

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We welcome input from the IIT community regarding fuel cells and their possible applications.