SFC’s Direct Methanol Fuel Cells: Lightweight, Portable Power for Soldiers in the Field

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Director Defense Division

Joint Service Power Expo 2009
Agenda

I. SFC – The Company

II. Fuel Cell Technology

III. Man Portable Power Solution

IV. Other Application
Company facts
- Founded in 2000
- Sole company with commercial DMFC products
- Location: Munich, Germany
- Location: Atlanta, GA, USA
- 105 employees
- ISO 9001:2000 certified
- Listed company since 2007

Products
- DMFC fuel cell systems
- Power Manager
- Methanol cartridges
SFC Markets & Products

Core Markets

Leisure - Comfortonomy

Remote Industrial - Dependability

Defense - Weight Saving

Products

- EFOY
- Fuel cartridges
- EFOY Pro
- Fuel cartridges
- FC-250
- Emily
- Jenny
- Power Manager

May 5, 2009

SFC fuel cells - reliable energy wherever you need it
Substantial Market Traction

- over 13,000 shipped fuel cells
- over 100,000 shipped fuel cartridges
- 5 million operating hours in user hands
## References Defense

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<tr>
<th>BMVg / BWB</th>
<th>Portable DMFC-Solution</th>
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<td></td>
<td>Vehicle backup power</td>
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<tr>
<th>PEO Soldier</th>
<th>US-Army Defense Acquisition and Challenge Program</th>
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<td>FFW</td>
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<td>Future Force Warrior</td>
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<td>ATEC</td>
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<td>US-Army Test and Evaluation Command</td>
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<th>AFRL</th>
<th>Battery renewable integrated tactical energy system (BRITES)</th>
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<td>AFSOC</td>
<td>Power Managers &amp; Jenny for Air Force Special Operations Command</td>
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| NATO-members:       | Finland, Netherlands, Norway, South Africa, Sweden, Switzerland, UK |
|---------------------|NIAG Study for vehicle APU|
The Fuel Cell Technology

Conventional generator

1. Liquid fuel → Thermal energy
2. Mechanic energy
3. Electric energy

Direct-methanol fuel cell (DMFC)

- One step – direct conversion
- High efficiency
- Low temperature
- Very low emissions
- No wear out

May 5, 2009  SFC fuel cells - reliable energy wherever you need it  SFC Smart Fuel Cell 8
Storage of 10 kWh of Energy

Methanol: weight: 8 kg, volume: 10 l
Hydrogen: weight: 85 kg, volume: 60 l
Lithium Batteries: weight: 110 kg, volume: 120 l
Lead acid batteries: weight: 270 kg

Methanol combines superior energy density with easy handling, shipping and low cost.
Agenda

I. SFC – The Company

II. Fuel Cell Technology

III. Man Portable Solution

IV. Other Applications
SFC Man Portable Fuel Cell Solution

Challenges:

- The longer the mission the heavier the soldier’s weight
- Limited mission capability due to increased weight
- Far away from any logistic institution
- No resupply during the mission duration
SFC Solution for remote / dismounted power supply

Power Manager

Jennv 600S

over 1,000 fielded
SFC Man Portable Power

Weight of technical equipment [kg]

Mission duration [h]

Advantages:

- more power, less weight
- elimination of spare batteries

SFC Fuel Cell System and hybrid battery up to 80%* weight reduction on a 72+ hrs Mission

*compared with conventional rechargeable battery packs
Winner of the wearable Power Prize Competition

1st Place!!
M-25

Prize Purse (US Dollars):
1st - $1,000,000.00
2nd - $500,000.00
3rd - $250,000.00

3rd Place!!
Jenny 600 S

May 5, 2009  SFC fuel cells - reliable energy wherever you need it
16 hours operation with 0.7 litre methanol at 50 watts

over 50% weight reduction in a 72 hours mission compared to BA 5590 batteries

Harvesting power from all different power sources
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<th>Weight</th>
<th>Energy</th>
<th>Volume</th>
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<tr>
<td><strong>Baseline</strong></td>
<td>35.5 lbs</td>
<td>2500 W·hr</td>
<td>11 L</td>
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<tr>
<td><strong>Spiral 1</strong></td>
<td>26.9 lbs</td>
<td>2620 W·hr</td>
<td>9.5 L</td>
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<tr>
<td><strong>Spiral 2</strong></td>
<td>~17-18 lbs</td>
<td>&gt;2500 W·hr</td>
<td>6.4 L</td>
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24% Reduction
14% Reduction
50% Reduction
33% Reduction

SFC solution
Power supply for German Mountain Infantry

- 16 hours operation with 0.35 liter methanol at 25 watts
- Automated, stand alone battery charging
Mission advantages

- Power Source for portable, mobile and stationary reconnaissance systems
- Endless power for night vision devices
- Reliable power for targeting systems
- Power radio communication
- Higher Mobility due to reduced weight
- No battery resupply/recharging in the field
ATEC uses SFC Fuel Cells for Test Instrumentation

100 hours operation @ 250 Watts with 28 liters fuel

- Reduced costs: replace one cartridge in every 4 days, no disposal fees
- Reduced weight: (24 kg) 53 lb fuel replaces (581) 1280 lb battery
- Invisible testing: Stand alone, automatic and quiet operation
Mobility

- Efficient power on board vehicles
- Fuel saving
- Independent of fossil fuels
- Undetectable / silent watch
- No connection to the engine power necessary
- Easy to install
Special Purpose Vehicles

- Reliable energy for all devices on board / mobile office
- Fully automatic recharge, maintenance free, easy integration
- No data loss due to empty batteries, no extra depot tours for recharges
- Unlimited mission times
- Inconspicuous, no emissions, no noise
Remote sensors, cameras, etc.

Unattended operation for weeks
Hybridized with solar power and rechargeable battery
Remote control available
Visit our Booth 210!

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