Formic Acid Fuel Cell Systems

Presentation to the ICAO DGP

Montreal, Quebec

April 18, 2005

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Presentation Outline

Portable Electronics and the Energy Pain

Micro Fuel Cell Technology

Formic Acid Fuel Cell Systems (FAFCS)

Safety Risks and Mitigation

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Portable Electronics are Everywhere



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The Energy Pain

Technological advancements

- Wireless, advanced graphics, video streaming

Current batteries

- Are not keeping pace with developments
- Reaching theoretical limits

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Micro Fuel Cells

A paradigm shift in power sources

Battery stores energy

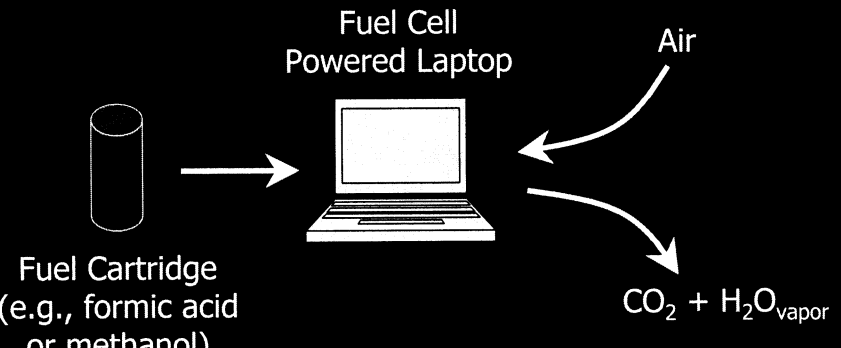
Micro fuel cell converts energy

Continuous fuel source via a cartridge

Instantaneous "hot swap" recharge

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How Micro Fuel Cells Work



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Formic Acid Fuel Cell Systems

FAFC Systems use formic acid as the fuel

- Formic acid concentration will be less than $85\%_{wt}$

Consists of two parts

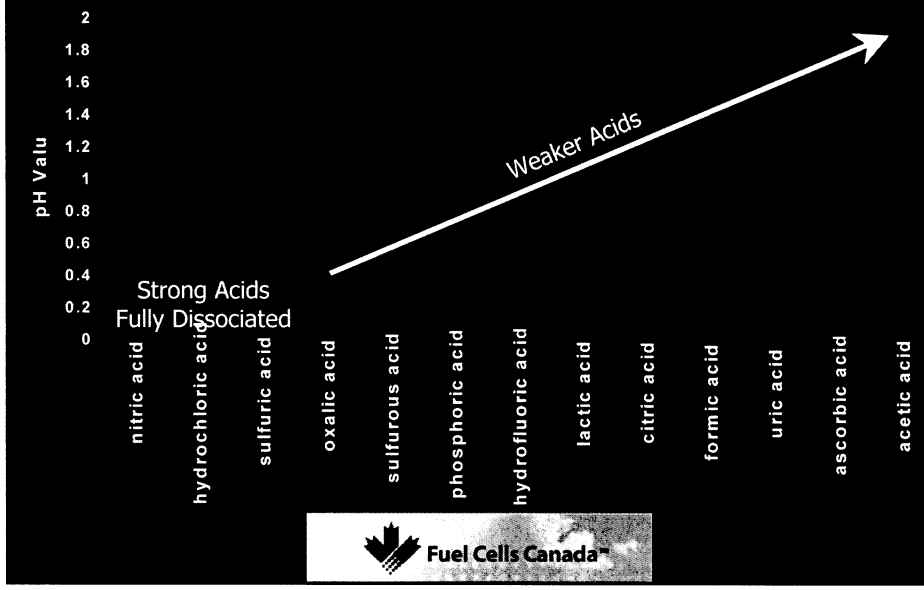
- Fuel Cell Power Unit – ***inside the device***
- Fuel Cartridge – connects to power unit

Exhaust consists of CO_2 and H_2O_{vapor}

Commercial Products Ready by end of 2006

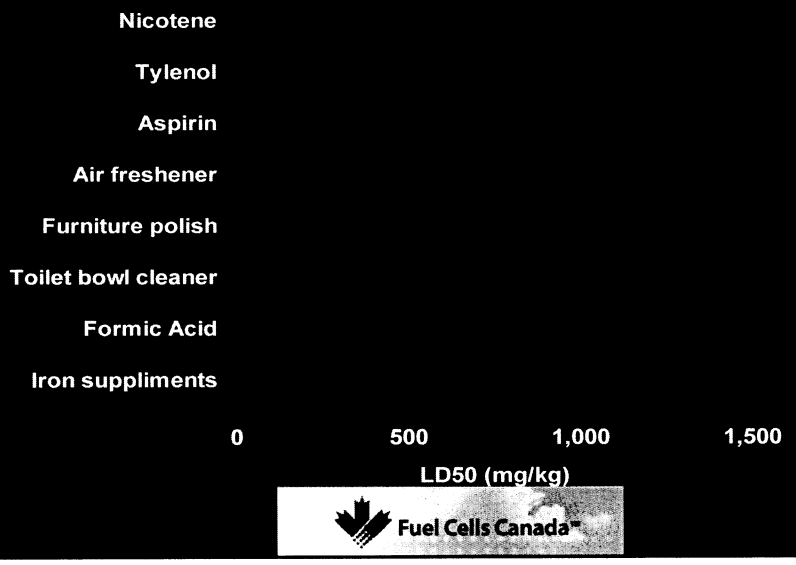
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Acid pH Comparison



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Formic Acid Toxicity Comparison



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Formic Acid Safety Facts

Corrosive (Class 8)

- Risk to humans via oral, inhalation and skin contact

Limits of inhalation exposure (OSHA)

- 5ppm (TWA – time weighted average of 8hrs)
- 10ppm (STEL – short term exposure limit)

No significant effect dose level for humans

- Recorded as 50mg/kg
- Acceptable daily intake as food additive is 5mg/kg

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Formic Acid Safety Resolutions

FAFC product will demonstrate sufficient safety and non-existence of unacceptable risks by:

- Completing a risk analysis, implementing risk mitigations, and performing rigorous qualification testing against each safety requirement
- Third party laboratory safety certification to a consumer safety standard (IEC Micro Fuel Cell Safety Standard or equivalent)

