Methanol Reformer
Feedstock
Methanol & Water

Methanol Overview

→ Methanol is a liquid fuel that is light, colorless, stable, and biodegradable
→ Methanol contains more hydrogen than any other liquid fuel
→ Methanol can be sourced regionally, and is produced globally at over 90 plants producing almost 24 billion gallons annually
→ Methanol is easily mixed with purified water in a batch process by local chemical distributors
→ Methanol & water feedstock can be delivered in 55-gallon drums or large 350-gallon stainless steel totes
→ Methanol is an excellent fuel choice for H₂ generators when storage and delivery of compressed gas cylinders are logistically challenging or impossible
H-Series Hydrogen Generators
Scalable - Reliable - Affordable

On-Site / On-Demand Hydrogen Generation
→ Reduces logistics related to delivery and storage of compressed hydrogen
→ More cost competitive vs. compressed hydrogen

Multi-Fuel, Modularity, Scale
→ Fuels: Methanol (Natural Gas / LPG in development)
→ Generates 15 sLm to 150 sLm H₂ per unit (Q4 2013)
→ Supports 1kW to 10kW fuel cell power load

Simple Design, Substantially Lower Part Count
→ Lower cost
→ Higher reliability
### Product Features and Performance

**Key Features**
- Fuel cell (PEM) + reformer system
- Methanol/water fuel
- Flexible fuel tank (up to 38hrs autonomy @ 5kW for 208 L)
- Easy-to-replace filters
- Lighter, compact and customizable

**Key Performances**
- up to 32% efficiency (@ 5kW)
- Fuel consumption < 1l/kWh
- Standby power requirements: <300W (@48Vdc)
- Stack life time: 10,000hrs
- Reformer lifetime: > 5,000hrs

<table>
<thead>
<tr>
<th>Run Time</th>
<th>Load</th>
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<tbody>
<tr>
<td>38 hours</td>
<td>5 kW</td>
</tr>
<tr>
<td>80 hours</td>
<td>2 kW</td>
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<tr>
<td>120 hours</td>
<td>1 kW</td>
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E1 System Advantages

- Small Footprint:
  - 2 x 19inch racks with Fuel Cell
- 2 cabinets with excess space / rack mountable
  - Can deploy each cabinet separately
- Consumption Example
  - 230 litre tank = 42 hours at 5kw
- Start up time: 90 seconds to full power
  - 108 ah/hr based on 5kw battery
- Low Power = 300 watts (standby)
  - 120 watts during production
Summary of Methanol Reformer

- Easier deployment options: rack mounted or 2 cabinet systems
- Eliminate cylinder delivery issues

Advantages over incumbent technologies
- LOWER TOTAL COST
  - Higher reliability lower repair costs improved availability
  - Fewer moving parts lower maintenance costs
  - Less theft
  - Lower environmental impact
  - Operates from -40C to +46C
  - Light & compact

Use cases with strong value proposition
- Regions with lower grid reliability (100 to 1,000 hours annual grid loss)