WHY METHANOL? – The Hydrogen carrier for the transition to a post-oil economy

Methanol is the most efficient, compact, and cost-effective technology for storing and transporting hydrogen. Methanol can also be produced from renewable sources. Methanol has approx. 10 times the energy density of hydrogen (in compressed gas cylinder)

Our fuel cell runs on methanol fuel. Methanol is a globally available commodity fuel with existing infrastructure that is already used for the production of a variety of products, like coatings and plastics, furniture and carpets, car parts or windshield washer fluid. It is cleaner and cheaper than fossil fuels while beating all other hydrogen carriers in fuel and infrastructure cost. Siqens is the only fuel cell company to use standard industrial methanol from any source.
Siqens management team members have combined more than 70 years of methanol fuel cell experience, including the Mercedes at Necar 5 and SFC's successful EFOY product range.

A study from China shows that the filling station infrastructure for hydrogen will be about 300 times more expensive than for methanol. Even normal EV charging infrastructure will be about 100 times more expensive (*Appendix 1*).
In addition, methanol itself is much cheaper than hydrogen – and even cheaper than natural gas due to logistics (*Appendix 2*).
The emissions are also lower - even compared to the current electricity mix of battery vehicles:
The CO_2 balance below originates from a study by Mads Fijs Jensen from Danish DOE and is mentioned in a document on renewable methanol from the Methanol Institute:

Type	Current Status	Green Scenario
Diesel	132 g/km	100 g/km
Gasoline	176 g/km	123 g/km
Hybrid	142 g/km	80 g/km
Battery electric	98 g/km	2 g/km
Hydrogen	178 g/km	3 g/km
Methanol	**83 g/km**	**2 g/km**

> *Widespread adoption of vehicles powered by renewable methanol would dramatically lower CO_2 emissions in transportation*

Wheel-to-wheel CO_2 emission – from Danish Department of Energy, Alternative Drivetrains 2014 *(JENSEN, Mads Friis)*

The reason for this outstanding carbon balance is the expense for storage and logistics for methanol (liquid), which is only 1-10% compared to hydrogen H_2 (in compressed gas cylinders).

KEY ADVANTAGES COMPARED WITH DIESEL, GASOLINE, AND HYDROGEN:

+ Liquid fuel with 10 x more energy density than pressurized hydrogen or lithium batteries
+ Worldwide available at low cost
+ Ease of handling and storage – comparable to diesel or gasoline
+ No need for regular inspections of appliances such as with pressurized hydrogen
+ Can be produced regeneratively com CO_2, non-food-biomass, or waste
+ More than 90% lower supply infrastructure cost than for hydrogen
+ Not subject to regular fees like Hydrogen cylinders

METHANOL SAFETY

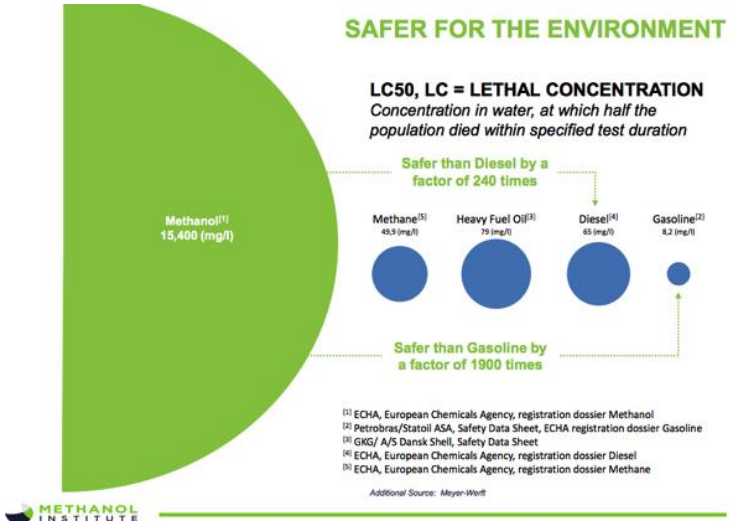
Just as for diesel and gasoline, safety requirements and regulations regarding use, storage and distribution of methanol have long been established and tested. User safety is paramount to Siqens. For this reason, we have developed a spill-free closed-loop adapter system on the market, protecting the user from direct contact with methanol.

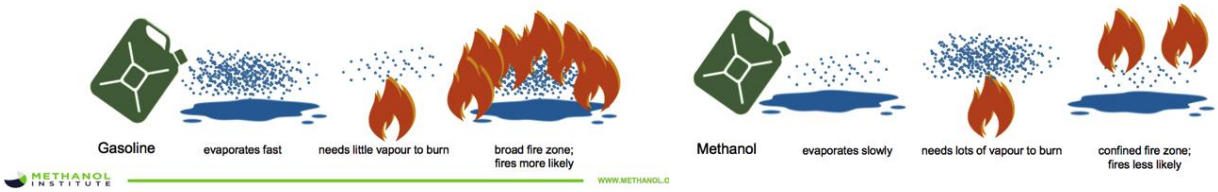
Our recommended solution: Siqens offers a 25 liters UN 3473 and ADR certified fuel cell cartridge for direct sale (*see QE Charge product sheet*). If you select this option, manual filling of the cartridges is not necessary. Only the removal system has to be plugged from one cartridge into the other. The user or refuelling service personnel does not come into contact with the fuel. The empty cartridge is closed and disposed of properly. The Siqens QE Charge fuel cell cartridge contains 25 liters of methanol. This corresponds to roughly 42 kWh in energy.

The ADR certified 25 l QE fuel cell cartrige is compliant with UN 3473 – fuel cell cartridges. All other options (60 l canisters, 200 l barrels) are classified as UN 1230 – Methanol.
Our connector avoids fuel exposure in all cases, the advantage of the UN3473 QE Charge is that up to 1000 l can be transported without speical hazardous liquid transport precautions (UN1230 : 300l).
If you prefer other sizes or a custom tank, Siqens can support with recommendations. We also do have a wide range of adapters available. Suiting your individual needs, the Ecoport can be equipped with a larger storage tank (ranging from 60 liters to 200 liters, or even 965 liters).

A safety comparison with gasoline is demonstrated at: https://methanolfuels.org/about-methanol/safety/

Methanol is less flammable, less dangerous, and 1.900 x safer to the environment than gasoline. Inhalative toxicity of methanol is lower. Ingestive toxicity is comparable to Diesel and Gasoline, in contrast to petrol fuels, Methanol is not carciogenic.





WHY NOT A DIESEL GENERATOR? – Reasons to switch from an established technology

The Siqens Ecoport Methanol fuel cell is the ideal power source in many applications with a power demand < 10 kW. It works at a fuel to electric efficiency > 38% and is designed for battery – hybrid operation. It operates without any harmful emissions and is very silent. While diesel generators may still excel in power density, fuel costs are generally higher and maintenance has to be conducted more frequently. Besides these economic drawbacks, generators are inefficient and have a negative impact on human health and the environment. In contrast, our fuel cell solution supplies safe, silent, emission-free and low-maintenance energy at any time.

KEY ADVANTAGES OF ECOPORT FUEL CELLS

+ The proposed solution comes with 4 independent Ecoport power generators, offering maximum redundancy while the generator is a single point of failure
+ > 38% Fuel to electricity efficiency
+ Up to 70% lower fuel cost than diesel or gasoline generators
+ No NOx or particle emissions
+ Up to 98 % less CO2
+ 90% lower noise
+ > 3000 h service interval
+ Diesel fuel is subject to ageing and needs to be replaced frequently, methanol as a pure substance will not decompose over time

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replacing diesel generators.
with SIQENS fuel cells.

OVERVIEW OF OUR ECOPORT METHANOL FUEL CELL SYSTEM

Methanol Fuel Cell

- Internationally patented
- CE certified
- 70 % lower fuel cost
- 99 % less emissions
- No noise, no thermal signature
- Operating range -20°C bis +50°C

Air Inlet

Exhaust

- No particles or NOx
- 35 dB whisper silent

Methanol Fuel

- 38 % efficiency
- 0.6 l/kWh only
- Low-cost IMPCA standard Methanol

Digital I/Os

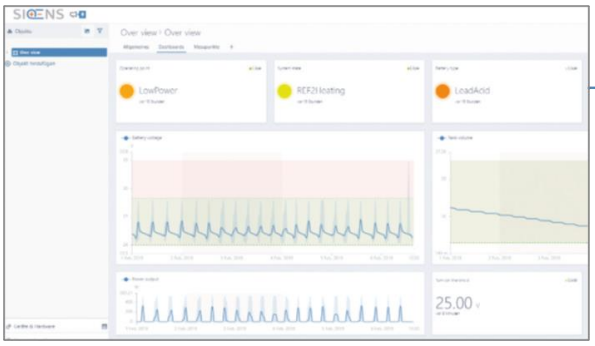
- Customizable interface

Battery

- Charges Li-Ion, Lead Acid, and all other batteries
- 24 V ETSI standard range

Control Panel

- Touchscreen operation
- Remote connectivity via mobile networks
- Quick configuration



Remote Monitoring

- Cloud based KPI reporting
- Preventive maintenance
- Remote asset management
- Refueling and service alerts
- Web Access, Win, Mac, IoS, Android

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MORE BACKGROUND INFORMATION ON METHANOL:

Appendix 1:
https://www.sciencedirect.com/science/article/pii/S254243511830401X

Appendix 2:
Watch the video of Mr. Wolfgang Chen from China, a regular guest at Siqens. It answers everything - that's why China is focusing on methanol.
https://www.youtube.com/watch?v=EleVTwnO2Ow

Appendix 3:
Some recommended links for more information on methanol:
https://ngi.stanford.edu/sites/default/files/20170731_Liquid_Sunshine_Pre-reading_material.pdf
https://www.advent-energy.com/htpem-methanol-fuel-cell-electric-car/