



zemships
ZERO EMISSION SHIPS

Climate protection to the fore
The first ever fuel cell driven passenger ship

h₂

Zemships - climate protection to the fore

There's nothing the people of Hamburg can do about their weather – but they can help their climate. In fact, this is where the FCS Alsterwasser, the first ever emission-free and climate friendly inland passenger vessel has been sailing since August 2008. The terminology FCS stands for Fuel Cell Ships. On trips on the Alster (the city's largest lake and inland waterway), the ship emits nothing but water: no soot, no oil and no CO₂ – just H₂O. The boat is the prototype for a new generation of pollutant-free, fuel cell driven vessels known as Zero Emission Ships.



The Zemships project was given the all-go in 2006, when a joint project was initiated involving nine companies and institutes. Building on the ship started only about a year later and, just eight months after launching, the fuel cell vessel was christened the FCS Alsterwasser at the ship naming ceremony in August 2008. The service suitability of this unusual "steamer" is to be tested on the Alster initially up to 2010, on regular excursions run by Alster Touristik GmbH. To make sure the EU-supported project does not run aground, all the vessel's operating data are being collected for scientific analysis.

The FCS Alsterwasser – environmental protection for the Alster

The FCS Alsterwasser looks just like any other Alster steamer, but you can easily spot the difference between it and a normal diesel driven vessel: you just have to listen. Its electric motor is so soft, you hardly know it's running. The hybrid fuel cell propulsion system – the engine's source of power – is not just friendly to the environment but to passengers as well.

On the FCS Alsterwasser, there is nothing that passengers lack – except hazardous emissions; in fact, they can enjoy exactly the same comforts on board as on other Alster boats. The engineers were so successful in designing the vessel's hull, that both the special technology required to propel the fuel cell ship – and 100 passengers – can be accommodated on board.

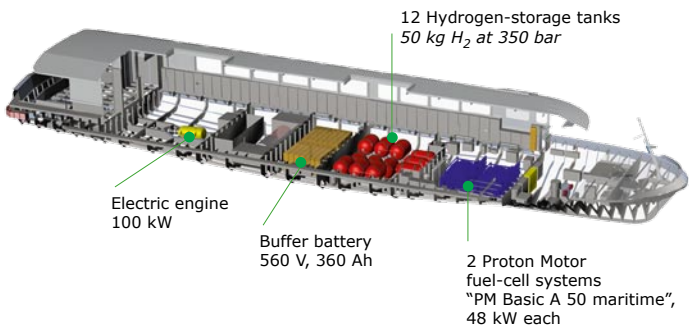
Passengers virtually never see, hear or smell anything to do with the hybrid fuel cell propulsion system or the hydrogen tank. This means they can enjoy the fresh air all the more. It is true: understatement is also a statement.





Fuel cell = efficient energy + environmental protection

How exactly does hybrid fuel cell propulsion work? When you get hydrogen and oxygen to react (in a fuel cell), the product of this “cold combustion” is energy – and water vapour. This the fuel cell passes on to a battery. The battery then supplies the propulsion power for the electric motor.



The propulsion system (Source: Schiffstechnik Buchloh)

The fuel cells used were specially developed for the FCS Alsterwasser. Their special features are that they are extremely powerful as well as shudder resistant. The vessel has two fuel cell systems, each with an output of 48 kW, which propel the motor via the battery’s buffer store at up to 100 kW (ca. 130 horsepower).

Until now, fuel cell technology has mostly been used on board military submarines and smaller vessels with an engine power of under 5 kW. One of the aims of the Zem-ships project is to demonstrate that larger, more powerful ships can be propelled by fuel cell systems as well.

The hydrogen fuelling station – high pressure and climate protection

The FCS Alsterwasser runs on hydrogen, so you can enjoy the fresh air. But how is the fuel cell ship supplied? One of the tasks the project comprised was to set up and operate a hydrogen fuelling station – the first stationary fuelling station for ferry boats. It is situated on a branch of the Alster, at the HOCHBAHN underground engineering depot. Hydrogen is delivered here in liquid form and stored in specially insulated tanks, at minus 253°C (-423.4°F). The hydrogen only evaporates when the ship fills up, to become GH_2 gas that is gradually compressed to 450 bar.



To prevent impurities contaminating the hydrogen, and to minimise unwanted mechanical friction, an entirely new method is used for the Zemships fuelling station: ionic compression. The Linde Group developed this process, that can compress hydrogen up to a pressure of 450 bar without using mechanical piston compression. The result is a marked increase in energy efficiency, and a simultaneous rise in the ship's kindness to the climate.

Get aboard – and discover your own special environment on a trip on the Alster.

Project partners:



Hamburg

Behörde für
Stadtentwicklung
und Umwelt



HOCHBAHN



Hochschule für Angewandte
Wissenschaften Hamburg
Hamburg University of Applied Sciences



THE LINDE GROUP



Proton Power Systems plc Group



Contact address:

Zemships
Öffentlichkeitsarbeit

Karim-Tarik Hammou
hySOLUTIONS GmbH
Steinstraße 25
20095 Hamburg

Phone +49 40 32 88-44 75

Cell +49 178 628 06 27

Fax +49 40 32 88-35 38

Email karim-tarik.hammou@hysolutions-hamburg.de

www.zemships.eu