

UTILISATION CONCEPT OF A FUEL CELL



BACKGROUND

The use of hydrogen (H₂) is considered a key building block in shaping the energy transition. Especially in the north of the Netherlands and Germany, where renewable energy is increasingly being produced, the use of hydrogen as an energy carrier is gaining in importance. H₂Watt provided the platform for the realisation of numerous implementation projects. The focus was on processes and systems for the efficient production, storage, transport and use of hydrogen. The innovation projects were mainly implemented on the islands of Borkum and Ameland, but also at Maritimes Technikum of the University of Applied Sciences Emden/Leer in Leer, where a fuel cell test stand was installed.

OBJECTIVES

The focus was the establishment of a real laboratory with a hydrogen fuel cell for maritime applications. The laboratory was and will continue to be used by the project partners and small and medium-sized enterprises.

With this test station, experience could be gained on the use of hydrogen fuel cells for ship propulsion concepts.

RESULTS

The fuel cell system was used with the following focal points.

Individual operation of the FC plant (teaching and research operation)

- Operation of the system with different operating states (load) and boundary conditions. Determination of the basic operating parameters (e.g. performance and consumption data).
- Development/expansion of expert knowledge in the handling of FC systems and hydrogen.
- Use of the plant for training purposes, internally in operation with students, externally with interested parties from industry and the maritime economy. Establishment

FUEL CELL



of a basic training programme on the subject of FC systems and hydrogen as a fuel.

- Establishment of an operating data pool to determine medium- and long-term changes in the operating behaviour of the plant.

Use of the facility in a maritime context (individual operation)

- In a first step, the system was examined in a maritime context for its suitability as an energy converter on ships (in competition with other propulsion systems). For this purpose, typical load conditions and load changes were simulated by the electrical load bank and the reaction behaviour of the FC system was investigated.
- Comparison of the system performance of the FC with the other power generators in the Maritimes Technikum.
- In this context, the constant supply of the simulated "ship's grid" with a stable voltage and grid frequency is of particular concern. The influence of a buffer battery on system performance was investigated separately.
- The implementation of these measurements was

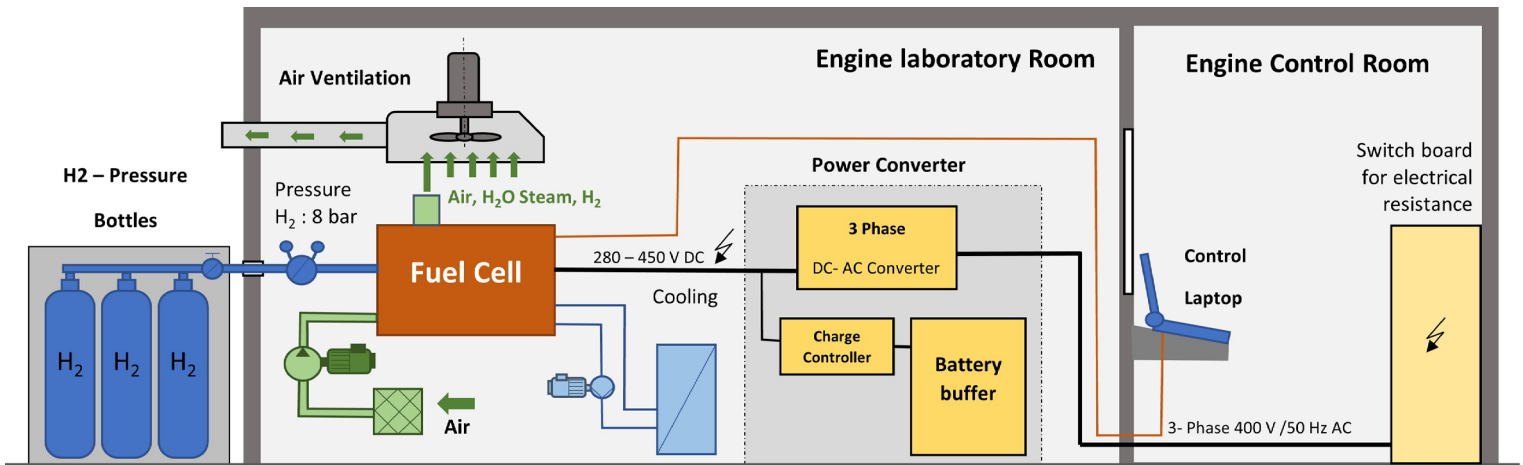
Contact



Freerk Meyer
Tel.: +49 171- 2222689
Mail: freerk.meyer@hs-emden-leer.de



UTILISATION CONCEPT OF A FUEL CELL



Basic structure of the FC module installation in the Maritime Technical Center

integrated into development projects (scientifically based work together with students).

- The experience gained from this research was integrated into the training concept.

Use of the FC plant in the maritime context together with other power generators of Maritimes Technikum

In ship operation, redundant systems are usually used to ensure the relevant functions on board. For this purpose, the three different energy generators were used together in Maritimes Technikum.

- Joint operation of the three power generators in different combinations and with different power ranges. Recording of the relevant operating parameters.
- Comparison of the different system responses with classic propulsion concepts.
- Investigation of the system performance of the FC system with and without battery storage.
- Use of the entire system for development and research

projects to clarify technical issues in the maritime environment of the university.

In addition: Investigation of the medium- and long-term system performance of the FC system

- In a later phase, targeted investigations were carried out that included the main focus on ageing properties and component service life. This question, which is central to economic operation in practice, can be determined in detail here for the entire life cycle of a fuel cell.

Supported by:



www.deutschland-nederland.eu

Further information at: www.h2watt.eu

Contact



Freerk Meyer
Tel.: +49 171- 2222689
Mail: freerk.meyer@hs-emden-leer.de

