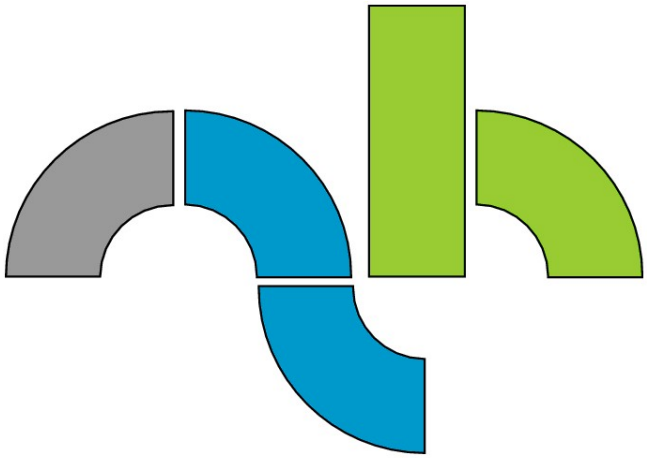

Roads2HyCom Hydrogen and Fuel Cell Wiki
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Hydrogen and Fuel Cells in Marine Transport

Document Tracking ID 6019

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http://www.ika.rwth-aachen.de/r2h/Hydrogen_and_Fuel_Cells_in_Marine_Transport
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About Roads2HyCom

Roads2HyCom is a project supported by the European Commission's Framework Six program. Its purpose is to assess and monitor hydrogen and fuel cell technologies for stationary and mobile energy applications.This is done by considering what the technology is capable of, relative to current and future hydrogen infrastructures and energy resources, and the needs of communities that may be early adopters of the technology.By doing this, the project will support the Commission and stakeholders in planning future research activities. Project main website: http://www.roads2hy.com

HyLights, Roads2HyCom and the Hydrogen and Fuel Cells Technology Platform (HFP)

The European Commission is supporting the Coordination Action "HyLights" and the Integrated Project "Roads2HyCom" in the field of Hydrogen and Fuel Cells. The two projects support the Commission in the monitoring and coordination of ongoing activities of the HFP, and provide input to the HFP for the planning and preparation of future research and demonstration activities within an integrated EU strategy.

The two projects are complementary and are working in close coordination. HyLights focuses on the preparation of the large scale demonstration for transport applications, while Roads2Hycom focuses on identifying opportunities for research activities relative to the needs of industrial stakeholders and Hydrogen Communities that could contribute to the early adoption of hydrogen as a universal energy vector.

Further information on HyLights is available on the project web-site at http://www.hylights.org.

Contents

Introduction

According to a report from Det Norske Veritas (DNV), the worlds shipping fleet accounts for 2% of global CO2 emissions, 4-6% of SOx emissions and 10-15% of NOx emissions [1]. Hydrogen and fuel cell technologies are a possible solution to the problem of reducing local and regional emissions caused by marine vessels.

PEM FC, SOFC and Molton Carbonate Fuel Cell (MCFC) technologies are all being considered for marine applications. Most of the prototype systems in use today are hybrids, using the fuel cell with batteries or super capacitors. Applications are from across the marine section and include APUs for luxury yachts and merchant vessels, powertrains for passenger ferries and tourist boats and powertrains for unmanned underwater vehicles (UUV) and submarines.

Main Players

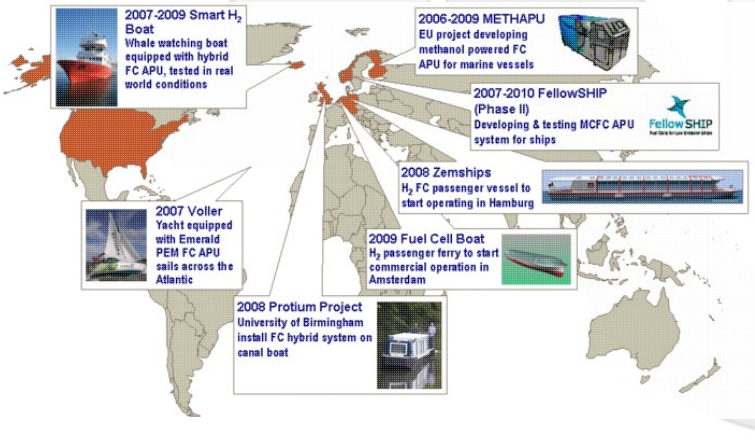
Wärtsilä are one of the main industrial players in the shipping industry who are investing in fuel cell technology. They are involved in a number of European projects, such as METHAPU [2] and FellowSHIP [3], which are seeking to demonstrate SOFC and MCFC technology applied onboard commercial vessels as APUs. Wärtsilä have a prototype 20 kW SOFC system for stationary commercial applications. This system uses SOFC technology developed by Topsøe Fuel Cell A/S. It is likely that Wärtsilä will adapt this fuel cell unit for marine applications.

Voller and Proton Motor are two fuel cell manufacturers active in applying their fuel cell technology to marine applications. In 2007 Voller fitted their Emerald PEM APU to a Beneteau Oceanis yacht, which they sailed across the Atlantic Ocean as part of the engineering trials for the fuel cell system [4]. Proton Motor are supplying the fuel cells for the Zemships project [5]

Within Europe there are a number of industry consortia developing fuel cell powered boats, mainly for the tourist industry. In Iceland, Icelandic New Energy have overseen the installation of the hybrid hydrogen fuel cell APU to the Smart H2 whale watching boat. In Hamburg, the Zemship (zero emission ship) tourist ferry has recently started operating on the Alster Lake[5]. In Amsterdam the Fuel Cell Boat project is building a fuel cell powered passenger ferry [6].

In North America, development of fuel cell technology for the marine sector appears to be focused on military applications, such as submarines and unmanned undersea vehicles (UUVs) [7]. Germany also appears to be active in developing fuel cell systems for underwater military applications. Companies involved in this area include:

- ITM Power (UK)
- Siemens Industrial Solutions and Services Group (Germany)
- Versa Power Systems, Inc. (USA)



Geographical overview of the main players applying H2&FC technology in the Marine sector

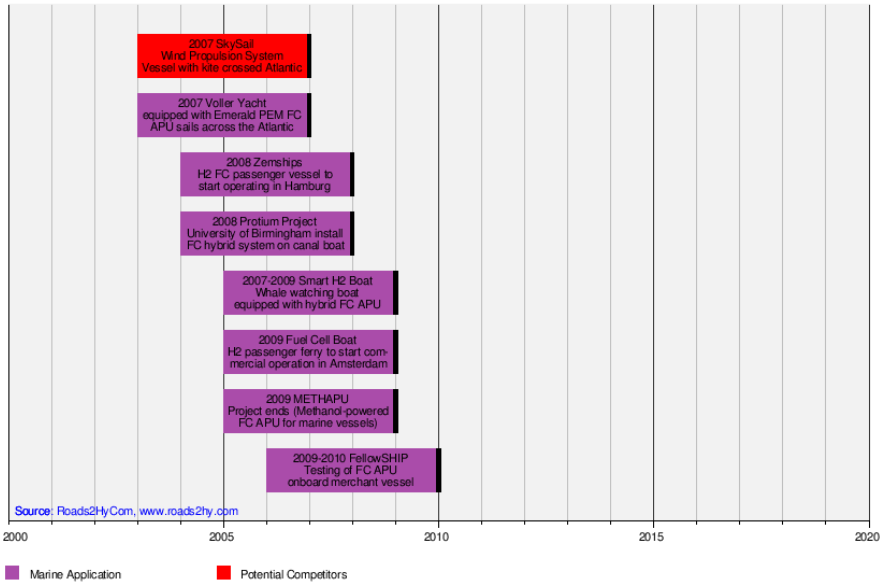
Recent Developments

Recent developments include the demonstration of fuel cell technology:

- On-board a whale watching ship (Iceland, 2007)
- On-board a yacht (Voller, November 2007)
- To power a canal boat (University of Birmingham, 2008)
- To power a tourist passenger ferry in Hamburg (Zemships, August 2008)

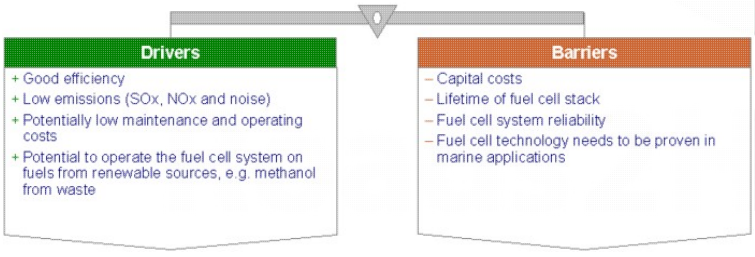
All of these projects used PEM FC technology. The whale watching ship, canal boat and Zemship use hydrogen as the fuel. The PEM FC system on-board the Voller yacht included a fuel reforming, allowing the Fuel Cell system to run on propane.

An overview of other recent key milestones of fuel cell technology in the marine sector is presented.



Drivers and Barriers

An overview for the drivers and barriers for applying fuel cell technology to marine applications is provided.



Drivers and Barriers for applying H2&FC technology to the Marine sector

Concluding Remarks

The marine industry is a possible market sector for fuel cell technologies. Early applications and demonstration projects are pleasure boats and passenger ferries. The fuel cell technology is used either as the main propulsion power source, or as an APU. Although these applications are mostly one-off or low volume

production vessels, these demonstration projects serve a useful purpose in increasing public awareness and acceptance of fuel cell technology.

In the long term, it is likely that fuel cell technology will be applied in large shipping vessels, probably as hybrid fuel cell APUs. However it is still to be proved if fuel cell technology can be suitably adapted to the marine environment of commercial shipping.

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