Lindert van Biert et al., J Fundam Renewable Energy App 2016, 6:7(Suppl)
http://dx.doi.org/10.4172/2090-4541.C1.024

Fuel cell systems for ships and pleasure boats

Lindert van Biert, Purushothaman V Aravind and **Klaas Visser**
Delft University of Technology, Netherlands

Modern vessels use an increasing amount of electricity, varying from small auxiliaries up to complete electrical propulsion systems. Although conventional diesel generator sets have proven to be a reliable and cost effective technology, there are important concerns about the emission of hazardous compounds, greenhouse gases, noise and vibrations. These not only affect the environment, but also the comfort and quality of life on-board. This is especially relevant for pleasure boats, such as cruise vessels and luxury yachts. Batteries can be used to supply electricity in a clean, silent and emission-free way, but only for a limited time span. Fuel cell systems, on the other hand, can provide electricity with a similar degree of comfort, while they can use more practical logistic fuels. Many choices can be made with regard to the type of fuel cell system and logistic fuel. The main characteristics of different fuel cell systems and logistic fuels are presented, as well as a brief analysis of the applicability of several combinations on ships. The results reveal that ship designers may face several trade-offs. The polymer electrolyte membrane fuel cell, often with pure hydrogen fueling, exhibits a relatively low investment cost, high specific power and good load following capabilities, while other fuel cell types, such as the solid oxide fuel cell, exhibit a higher electrical efficiency and greater fuel flexibility due to their elevated operation temperature. In addition, it is shown that low volumetric density of hydrogen results in storage volumes up to 5 times larger compared to more energy dense alternatives, such as liquefied natural gas, methanol or diesel. The adoption of maritime fuel cell systems is expected to result in a step change in comfort on-board, since the fuel cell tandem has near-zero hazardous emissions, low greenhouse gas emissions and produces almost no noise and vibrations.

Biography

Lindert van Biert is a shared PhD candidate at the Process & Energy Department and the Maritime & Transport Technology Department at the faculty of Mechanical, Maritime and Materials Engineering, Delft University of Technology. His research activities are focused on the maritime application of fuel cell systems. His work is part of the Dutch National GasDrive project, which studies the concept of an LNG fueled SOFC/reciprocating engine hybrid for ships, combined with an underwater exhaust and novel drag reducing hull nano laminates.

l.vanbiert@tudelft.nl

Notes: