Cyprus University of Technology

Faculty of Geotechnical Sciences and Environmental Management

Bachelor's Thesis

The use of Hydrogen in Marine Applications

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ABSTRACT

The global marine shipping industry emits approximately 1 billion tons of CO_2 annually which equals to 2,5% of the global GHG emissions from human activities. According to the IMO shipping emissions are expected to increase by 50% to 250% in the next 50 years with the current pace. The question is how hydrogen can contribute towards the decarbonization of the shipping sector and how realistic will be to replace fossil fuels which are the main source of energy used on marine engines.

As it is well established, hydrogen is the most abundant element in the universe thus, it can be extracted and produced via a variety of processes which are thoroughly described in this thesis. Despite its promising properties and the fact that it produces almost zero emissions during combustion, hydrogen may promote difficulties in its storage and transportation. Moreover, the need for compression and liquification will be an additional cost to the overall price of hydrogen.

The introduction of hydrogen in the marine industry and more specifically in marine engines is evolving rapidly mostly due to the IMO's regulations concerning SO_x emissions. As it can be further seen in this thesis, hydrogen can be used in a plethora of ways to achieve power for the propulsion system of a vessel. Fuel cells are also a huge researched application with a few existing applications.

All in all, the need for an alternative energy source is needed in order to minimize the human impact on the planet. By promoting hydrogen in the marine industry and in marine engines, it will be an immense initiative towards other sectors to follow. It has already been established that hydrogen is used by huge car manufacturers for fuel cell cars.

Keywords: hydrogen, marine industry, marine engines, fuel cells