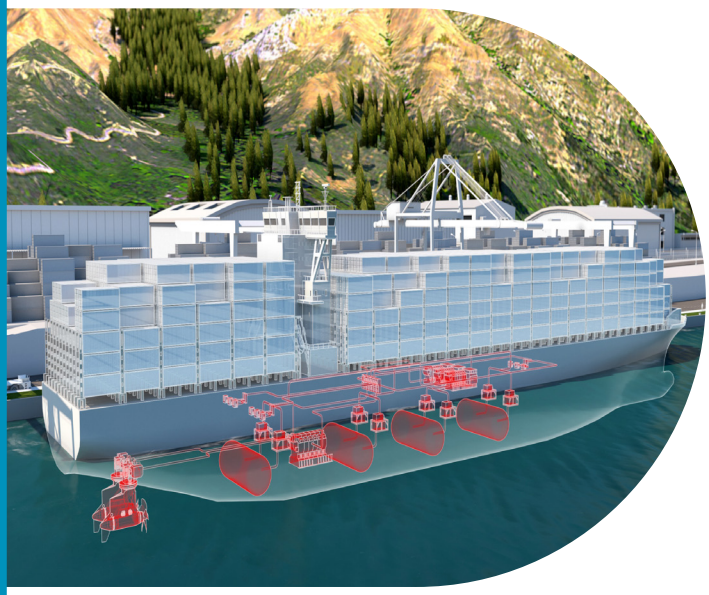
Concept illustration of a large vessel powered by fuel cells. Credit: ABB



SUSTAINABLE SHIPPING

The maritime sector is looking to platinum-based fuel cells as it moves to zero emissions 'well to wake'

Shipping is vital to the global economy, with some 90 per cent of all freight goods transported by sea. However, ships rely on fossil fuels for power, with shipping responsible for around 2.5 percent of the world's total greenhouse gas emissions. In common with other forms of transport, the maritime sector is committed to reducing its carbon footprint and the International Maritime Organization, a United Nations agency responsible for regulating shipping, has set a global target to cut annual emissions by at least 50 percent by 2050 from 2008 levels.

Industry insiders believe that hydrogen-powered proton exchange membrane (PEM) fuel cells using platinum catalysts offer the potential for shipping to achieve zero emissions 'well to wake', where hydrogen generated from renewable sources is used as a fuel source, making the entire energy chain clean.

Collaboration between experts in the field is turning this vision into reality. Hydrogène de France is working with ABB to assemble and produce megawatt-scale power plant for marine vessels, using PEM fuel cells. This initiative is based on technology developed by Ballard Power Systems, which has itself only recently announced the launch of the fuel cell industry's first module designed for primary propulsion power in marine vessels, such as passenger and car ferries.

Meanwhile in Scotland, the world's first hydrogen-fuelled ferry is set to undergo testing and businesses in Norway are developing the first hydrogen PEM fuel cell cruise ship. The vessel's proposed 3.2mw fuel cell would enable it to sail emissions-free for significant distances. In Japan, plans are afoot to build a 100 passenger capacity high-power fuel cell vessel as a medium-sized tourist ship, while Europe's largest ship builder, Italy's Fincantieri, has recently taken delivery of a fuel cell stack. The stack, produced by Swedish company PowerCell, will be used to test both propulsion and power generating systems in marine applications.

Maritime vessels powered by electricity from batteries alone are already operating on waterways where short distances allow for regular recharging.

PowerCell's MS-30 fuel cell system. Credit: PowerCell

However, these are not suitable for larger ships covering greater distances. Only PEM fuel cells can meet the payload, range and rapid refuelling required by these vessels. Fuel cells turn the chemical energy from hydrogen into electricity through an electrochemical reaction; a fuel cell can have a battery as a system component to store the electricity it is generating.

Wider benefits

The well to wake concept brings wider benefits, too, creating as it does a hydrogen value chain that can be leveraged by other users and, landside, port operators are also embracing the hydrogen economy. For example, Forth Ports has reached an initial agreement to begin detailed feasibility studies for a proposed natural gas power station and hydrogen generation plant at Grangemouth, which could ultimately lead to the distribution of liquid hydrogen and other fuels around Scotland and the rest of the UK.

Fuel cell electric vehicles (FCEVs) are also being adopted at port locations, as demonstrated by the H2Ports project at the Port of Valencia, which is focused on showing how hydrogen FCEVs can be used to decarbonise port logistics.

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