

Marine Application of Carbon Capture Technology

PMW Technology

Issue

Marine carbon emissions represent 2.5% of the global total (IMO) but conventional solutions are insufficient to achieve net zero emissions. Carbon capture has not been considered but may offer a lower cost transition for existing technology in advance of future developments.

Concept

The options to deliver the commitment to achieve net zero carbon emissions from shipping by 2050 have been evaluated in studies for the DfT, calling for a transition to zero carbon fuels. The possibility of carbon capture was not assessed as conventional chemical technology would not be feasible on board ship. Recent developments in chemical-free carbon capture by PMW Technology use low temperatures to freeze the carbon dioxide out of engine exhaust gases, offering the possibility of a faster, cheaper route to marine decarbonisation.

Activity

Working with naval architects Houlder Limited and the University of Chester, PMW Technology's T-TRIG project analysed the A3C low temperature carbon capture process applied to two modern ship designs. The case studies examined the feasibility, performance and cost of the process.

The delivery of liquid carbon dioxide from shipping to ports is an essential part of the concept and integration of port facilities with the proposed industrial carbon capture clusters was explored. Finally the costs of marine decarbonisation by carbon capture were evaluated on the same basis as prior DfT studies.

Outcomes

Process modelling by PMW Technology and the University of Chester proved the feasibility and assessed the energy consumption of the A3C process for decarbonizing shipping. Houlder Limited showed that for both case studies the equipment and carbon dioxide storage tanks could be located with small impacts on cargo carrying capacity while assuring ship stability.

Working with Tees Valley Combined Authority, port unloading and transfer of liquid carbon dioxide to geological storage were found to support the development of the proposed UK carbon capture clusters, enhancing their utilization and further development. The total cost of marine carbon abatement by A3C carbon capture was shown to be a decisive 50% cheaper than zero carbon fuels on a comparable basis.

With further funding and exploitation, this technology could substantially contribute to achieving decarbonisation commitments within the marine sector.

Impact:

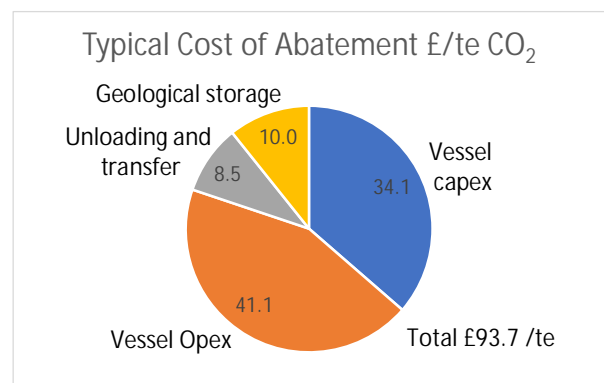
Advanced carbon capture could halve the cost of marine decarbonisation and give the UK a lead in its application.

Implementation Pathway:

We will partner with major energy and shipping companies to build a pilot and then develop a demonstrator for shore and subsequently sea trials in 2023.



Engine room of the SIEM Confucius – case study.
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