

Net-Zero Power Technology for Water Transport

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Abstract

To achieve net zero CO₂ emissions for maritime vessels, various technologies with carbon-neutral fuels and required engine combustion systems are being studied and developed. This lecture is aiming to discuss and summarise the production and supply of green and blue methanol, hydrogen and ammonia then explore those fuels' combustion characteristics and required combustion technologies to support direct net zero emissions or integrated CCS (Carbon Capture and Storage). As hydrogen can help internal combustion engines and industrial gas turbines to implement fast ignition and high temperature combustion, the difficulty for hydrogen storage and high NO_x emissions generated by high combustion temperature need necessary research outcome. Ammonia can be stored with liquid stage (for high energy density) easier than hydrogen, but it is difficult to get ignition and its low combustion temperature limits the combustion efficiency. Combining hydrogen and ammonia for dual fuel combustion can get a better solution if the fuel supply system can be developed well and the combustion control can be managed for ideal combustion phase. Green methanol has been employed with several demonstration applications on maritime ships, while CCS must be integrated for obtaining onboard zero CO₂ emissions.