

Environmental and Economic Analysis of Absorption Air Conditioning Unit Onboard Marine Vehicles: Case Study of Passenger Vessel

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Abstract : One of the most important equipment that affects the performance of passenger ships is the air conditioning system, which in turn consumes considerable electric loads. In this paper, the waste heat energies of exhaust gases and jacket cooling water of marine diesel engines for these ships are analyzed to be used as heat sources for absorption refrigeration unit (ARU). Economic and environmental analysis of the absorption refrigeration cycle operated with the two heat sources that use lithium bromide as absorbent is carried out. In addition, environmental and economic analysis for the absorption cycle is performed. As a case study, high-speed passenger vessel operating in the Red Sea area has been investigated. The results show that a considerable specific economic benefit could be achieved in case of applying absorption air condition that operates by water cooling system over that operates by main engine exhaust gases. Environmentally, applying ARU machine during cruise will reduce total ship's fuel consumption by about 104 ton per year. This will result in reducing NO_x, SO_x, and CO₂ emissions with cost-effectiveness of 6.99 \$/kg, 18.44 \$/kg, and 0.117 \$/kg, respectively.

Keywords : ship emissions, IMO, lithium bromide-water ARU, analysis, thermodynamic, economic and environmental analysis

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