The Analysis of an Ocean Thermal Energy Conversion using Mixture as the Working Fluid

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Abstract

Ocean thermal energy conversion (OTEC), which is an abundant renewable energy for sustainable development, is among the most promising options for tropical and subtropical regions worldwide. The limited temperature difference between the surface and deep seawater limits its application. The application of a carbon dioxide mixture as the working fluid in a thermodynamic cycle is investigated. By leveraging the characteristics of saturated temperature glide to improve heat conversion efficiency, increase net power output, and thereby reduce the cost of hydrogen production via electrolysis in OTEC power plants. For CO2/R717 the mass mixing ratio and the effects of saturated-temperature glide during evaporation and condensation are investigated. The results indicate that the optimal state is achieved when the saturation temperature glide is 6.77°C during the optimal evaporation process. At this point, the CO2/717 mixed OTEC system achieves the maximum net power output. Compared to the OTEC system using pure CO2 as the working fluid, the net power output is increased by 48.23%.

Keywords

Ocean thermal energy conversion (OTEC), mass mixing ratio, power output.