Waste heat recovery technologies for offshore platforms

This article aims at finding the most suitable waste heat recovery technology for existing and future offshore facilities. The technologies considered in this work are the steam Rankine cycle, the air bottoming cycle and the organic Rankine cycle. A multi-objective optimization approach is employed to attain optimal designs for each bottoming unit by selecting specific functions tailored to the oil and gas sector, i.e. yearly CO2 emissions, weight and economic revenue. The test case is the gas turbine-based power system serving an offshore platform in the North Sea. Results indicate that the organic Rankine cycle technology presents larger performances compared to steam Rankine cycle units, whereas the implementation of air bottoming cycle modules is not attractive from an economic and environmental perspective compared to the other two technologies. Despite the relatively high cost of the expander and of the primary heat exchanger, organic Rankine cycle turbogenerators appear thus to be the preferred solution to abate CO2 emissions and pollutants on oil and gas facilities.

As a practical consequence, this paper provides guidelines for the design of high-efficiency, cost-competitive and low-weight power systems for offshore installations.

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