Analyzing A Low-Grade Heat Rankine Cycle Using Different Working Fluids

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Abstract:

Rankine cycles are types of power cycles that utilize a working fluid, also known as the heat transfer fluid, to provide a work output form the cycle's turbine in order to generate power. In fact, Rankine cycles operate over a wide range of temperatures, from low-grade temperature sources (for example: solar, geothermal and other energy sources) to high-grade heat sources. Choosing the working fluid in a Rankine cycle depends on many factors such as: the thermal efficiency of the cycle, the fluid's availability and the safety precautions associated with using that type of fluid. In this work, five working fluids (Carbon Dioxide, R134a, R600, HFE7000 and n-Pentane) will be tested in a Rankine cycle via simulation models to check the thermal efficiency and performance of each fluid. Results showed that carbon dioxide (CO2) provided better results among other alternatives with a thermal efficiency reaching 20% and a generated work output reaching 100 kW.

Keywords:

Rankine Cycles, Working Fluids, Thermal Efficiency, Carbon Dioxide.