A THERMAL ANALYSIS OF AN IMPROVED RANKINE STEAM POWER CYCLE

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ABSTRACT

To improve the thermodynamic thermal efficiency (TE) of the basic Rankine steam power cycle (RC) the average boiler temperature should be increased and/or (2) the condenser temperature should be lowered. This paper considers modified RCs such as (1) RC with reheating, (2) regenerative RC and (3) combinations of (1) and (2). One or more turbines and pumps are included in this analysis. The compression processes of water inside pumps and expansion of steam inside turbines are assumed isentropic.

The pressure losses inside the boiler and condenser are ignored. The optimizations of thermodynamic thermal efficiency (TE) of those cycles were carried out under the constraint of non-saturated steam state at turbine outlet(s). Pressure and temperature are the optimization parameters. The results indicate that near-optimal cycles performance may be achieved under certain power cycles layouts.

KEYWORDS: Rankine Cycle, Thermodynamic Thermal Efficiency, Optimization