# Study of S-$CO_2$ power cycle with air-cooled system for desert climate

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**Abstract**

The supercritical carbon dioxide (S-$CO_2$) Brayton cycle has been receiving worldwide attention due to the high thermal efficiency and simple system configuration. Differ from the conventional steam Rankine cycle, the S-$CO_2$ Brayton cycle operates without phase change such as condensation process. Therefore air-cooled system can be considered as waste heat rejecting system. Furthermore a power plant can overcome site limitation with air-cooled system, so KAIST S-$CO_2$ research team suggested an air-cooled S-$CO_2$ power cycle for desert climate. A combined cycle gas turbine (CCGT) power plant, which utilizes waste heat of gas turbine for bottoming cycle, was re-evaluated with various S-$CO_2$ bottoming cycles. Compare to the reference steam Rankine cycle, the S-$CO_2$ power cycle showed better performance as a bottoming cycle. In this study, the comparison of various S-$CO_2$ cycles for waste heat recovery system and the applicability of S-$CO_2$ power cycle with air-cooled system for desert climate are covered.

KEYWORDS

Supercritical $CO_2$, S-$CO_2$ Brayton Cycle, Power generation, Desert climate, water free power plant.