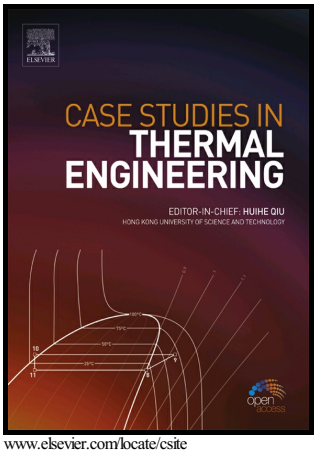

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Energic, Exergic, Exergo-economic investigation and optimization of Auxiliary Cooling System (ACS) equipped with Compression Refrigerating System (CRS)

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Heller main cooling tower as air-cooled heat exchanger is used in the combined cycle power plants (CCPP) to reduce the temperature of condenser. In extreme summer heat, the efficiency of the cooling tower is reduced and it lessens performance of Steam Turbine Generation (STG) unit of Combined Cycle Power Plant (CCPP). Thus, the auxiliary cooling system (ACS) is equipped with compression refrigerating system (CRS). This auxiliary system is linked with the Heller main cooling tower and improves the performance of power plant. In other words, this auxiliary system increases the generated power of STG unit of CCPP by decreasing the temperature of returning water from cooling tower Therefore, in the first step, the mentioned auxiliary cooling system (ACS) as a heat exchanger and compression refrigerating system (CRS) have been designed via ASPEN HTFS and EES code respectively. In order to validate their results, these two systems have been built and theirs experimentally obtained data have been compared with ASPEN and EES results. There are good agreements between results. After that, exergic and exergo-economic analysis of designed systems have been carried out. Finally, the compression refrigerating system (CRS) has been optimized via Genetic Algorithm (GA). Increasing in exergy efficiency (ε) from 14.23% up to 36.12% and decreasing the total cost rate ($\dot{C}_{System}$) from 378.2 (\$/h) to 308.2 (\$/h) are as results of multi-objective optimization.

Keywords: Heller Cooling tower, auxiliary cooling system, compression refrigerating system, Exergy, Exergo-economy, Optimization.