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# ASSESSMENT AND OPTIMIZATION OF A NOVEL SOLAR DUAL ORGANIC RANKINE CYCLE TRIGENERATION SYSTEM BASED ON EXERGY AND EXERGOECONOMIC ANALYSES

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This research proposes and models exergetically and economically the novel trigeneration system made up a dual organic Rankine cycle (DORC) integrated with the solar flat plates. The proposed system is undertaken to deliver electricity power, heating and cooling effects. The desired system is equipped with an ejector cooling cycle to provide the cooling load. In order to enhance the system operation, copper oxide (CuO) nanoparticles are utilized inside the heat transfer medium in the solar subsystem. The impacts of several substantial design parameters are evaluated on the annual exergy efficiency as well as the total product cost rate of the system for various insolation for each month. Two groups of working fluids namely R1234yf-R245fa and R423A-R236fa are applied inside the DORC. Sensitivity analysis implies that the increment of the ejector outlet pressure has a positive effect on both exergetic and cost performance of the system for all studied working fluids. Additionally, an evolutionary algorithm is used to find the optimum exergetic and economic performance of the system. Optimization results show that the annual exergy efficiency and the total product cost rate are improved within 24.4% and 11.8%, respectively for R1234yf-R245fa and they are modified by about 19.3% and 15.3%, respectively for R423A-R236fa.

### Recent Publications

1. Boyaghchi F A and Nazer S (2017) Assessment and optimization of a new sextuple energy system incorporated with concentrated photovoltaic thermal-Geothermal using exergy, economic and environmental concepts. Journal of Cleaner Production 164:70-84.
2. Boyaghchi F A and Asgari S (2017) A comparative study on exergetic, exergoeconomic and exergoenvironmental assessments of two internal auto-cascade refrigeration cycles. Applied Thermal Engineering 122:723-737.
3. Boyaghchi F A, Mahmoodnezhad M and Sabeti V (2016) Exergoeconomic analysis and optimization of a solar driven dual-evaporator vapor compression-absorption cascade refrigeration system using water/CuO nanofluid. Journal of Cleaner Production 139:970-985.
4. Boyaghchi F A and Montazerinejad H (2016) Multi-objective optimisation of a novel combined cooling, heating and power system integrated with flat plate solar collectors using water/CuO nanofluid. International Journal of Exergy 21(2):202-238.
5. Boyaghchi F A, Chavoshi M and Sabeti V (2015) Optimization of a novel combined cooling, heating and power cycle driven by geothermal and solar energies using the water/CuO (copper oxide) nanofluid. Energy 91:685-699.

### Biography

F A Boyaghchi has completed her BSc, MSc and PhD degree in the Energy Conversion field from the University of Science and Technology (IUST), Tehran, Iran. Now, she is working as an Associate Professor of Mechanical Engineering Department in the Faculty of Engineering and Technology at Alzahra University. She is the Head of Mechanical Engineering group and has her expertise in solar thermal system design, environmental assessment and optimization. Renowned for her pioneering works in the area of renewable energy technologies. She has authored and co-authored more than 50 refereed journal and conference papers and a book chapter published by Elsevier.

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