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An advanced computing method based on artificial intelligence applied for optimization and design of solar-photovoltaic refrigeration system

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Abstract

In this work, a hybrid method based on neural network and particle swarm optimization is applied to literature data to develop and validate a model that can predict with precision vapor-liquid equilibrium data for the binary systems (hexafluoroethane (R116(1)), 1,1,1,2-tetrafluoroethane (R134a) and R1234ze) used for solar-photovoltaic refrigeration system. ANN was used for modelling the non-linear process. The PSO was used for two purposes: replacing the standard backpropagation in training the ANN and optimizing the process. Statistical analysis of the predictability of theptimizedeural network model shows excellent agreement with experimental data (coefficient of correlation equal to 0.998). Furthermore, the comparison in terms of average relative deviation (AARD%) between, the predicted results shows that the ANN-PSO model can predict far better the refrigerant mixture properties than classical models. This new approach has allowed the development of computer program in (MATLAB 2017) for the execution of optimized model which can provide a useful tool for design study (changing the solar system parameters-inputs of graphical user interface- and the evaluation of the efficiency of solar system (given as output parameter).

Biography:

Abdallah el hadj Abdallah is a researcher (PhD) from Algeria (University of Blida) has his expertise in modelling, optimization with Artificial intelligence in many fields (Renewable energy, Phase Equilibria, Water treatment). His main interest in the last years is the application of the advanced computing Methods for the development of computer tools (graphical user interfaces) that help the design studies of technical process by minimizing the number of experiences.

Speaker Publications:

1. "Novel Approach for Estimating Monthly Sunshine Duration Using Artificial Neural Networks: A Case Study" Journal of Sustainable Development of Energy, Water and Environment Systems Volume 6, Issue 3, pp 405-414.
2. "Estimation of Properties of Liquid-Vapor Mixture of Some Refrigerants at High Pressure for Solar- Photovoltaic Refrigeration" Renewable Energy and Power Quality Journal
3. "Supervised artificial neural network-based method for conversion of solar radiation data (case study: Algeria Theoretical and Applied Climatology 128(1-2).

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