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Title-	Study of Performance of Solar Thermal Power Plant Using Various types of Thermodynamic Cycles
Department-	Department of Mechanical Engineering
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Findings

Application of soft computing models and artificial intelligence have emerged as one of the most widespread techniques for forecasting total solar radiation assessment due to it being cost-effective and precise. The contemporary research enumerates the multiple performance attributes of five different popular algorithms (SVM, ANFIS, ANFIS-GA, RSM and ANN) for prediction of daily global solar radiation. The following conclusions can be drawn based on the present investigation. After exploring several researches, a ranking based review on predictive techniques for solar radiation prediction was found to be an area which still needs to be explored. Thereby, looking at the positives ANN model is suggested for future algorithms for hybridization to predict solar radiation based on multiple criterions. Accuracy is the most significant attribute while selection of a prediction model for daily solar radiation simultaneously as its percentage contribution is the maximum (48.28%) followed by skill requirement (31.38%), time (14.41%), and cost (5.9%). Among the possible prediction models, ANN scores the best score, followed by SVM, then ANFIS-GA, ANFIS and finally the least favourite comes to be RSM.

Secondly, the research explored a steam turbine-based cogeneration and trigeneration systems running on solar thermal energy to produce multiple outputs of energy like electricity, process heating, and cooling. The enhancement in the performance of an energy conversion system has been clearly seen after changing its mode from power generation to cogeneration and then to trigeneration. Effect of DNI and mass flow rate and on exergy and energy destructions is explored. Exergy destruction in each component is explored in the study. A considerable amount of heat destruction occurs in the HRSG around 5.23%. Out of 100% solar energy output of the cycle, 29% is converted into turbine work and 1.39% into the exergy accompanied by process heat. The cogeneration efficiency for all DNI are lies in the range of 32% to 35%, when vapour absorption refrigeration (VAR) was employed to produce cooling simultaneously with the power and process heat, their efficiency is raised to 65%. The energetic output further increased from 58% to 63% when the mode of operation changes from cogeneration to trigeneration.

Finally, in order to establish the feasibility of the current model by calculating the values of total radiation and useful energies for all three tilted angles we have selected the evacuated tube solar collector to run the Kalina cycle. At last, we have calculated the useful energy provided by the set of ETC with the help of other parameters. The working fluid of the Kalina cycle is an ammonia-water mixture. We have calculated the turbine work, pump work, heat input, and finally the thermal efficiency of the cycle. After that, we changed the input and output parameters of the turbine to see the effect of thermal efficiency on ammonia mass fraction. Winter seasons have a higher value of tilt angles than the summer season. The average tilt angles for selected cities during the winter season are 51.63 (Delhi), and 45.70 (Kolkata). 42.17 (Mumbai), 36.05 (Chennai). It is recommended that if possible, the surface must be inclined on a tilt angle for better utilization of solar radiation. If varying the tilt angle is not possible then the Annual optimum tilt angle can be used for surfaces with fixed inclination. It is very helpful to reduce operation and installation costs.