

# Simulation of Solar Thermal Hybrid Heating System Using Neural Artificial Network

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Abstract:

Artificial neural network (ANN) used to predict the performance of Solar Thermal Hybrid Heating System, which is used to maintain a swimming pool at 30 °C all year around. The solar energy is collected using evacuated tubes collectors, within which water is heated up as it flows inside the tubes, before it is introduced into a heat exchanger located inside a large well insulated storage tank, where it cools down as it loses heat to water in the tank. In winter, during cloudy days, an auxiliary system (in addition to the solar thermal system) was used to provide the required heating load. Three types of auxiliary systems were used namely; natural gas, electrical power and diesel powered boiler. In addition an energy management system is used to optimize the percentage of the heating load to be supplied by each auxiliary heating system. Six inputs variables (auxiliary systems type, ambient temperature ( $T_{amb}$ ), solar radiation intensity ( $G_t$ ), wind speed (WS), relative humidity (RH), and Air pressure (AR)) are used in training NARX network. One output variable is average temperature of the pool. Previous experimental data are used to train the neural network. It was found that NARX network is very much capable to estimate the temperature distribution within each of the four layered walls with excellent accuracy .