

Analysis of exergetic performance for a solar air heater with metal foam fins

In this experimental study, an exergetic analysis is presented for solar air heaters (SAHs) that have absorber plates equipped with different fin arrangements. The following two types of fins were used: solid fins (conventional) and metal foam fins. Longitudinal, staggered, and corrugated fin arrangements in SAHs were investigated under the weather conditions experienced in Baghdad, Iraq in February to April 2018. The exergy efficiency and exergy loss of the SAHs were evaluated for five air mass flow rates ranging from 0.011 to 0.059 kg/s. Based on the exergy analysis, SAHs with metal foam fins are more efficient than those with solid fins. In addition, corrugated metal foam fins introduce more turbulent flow than the other fin configurations. It was found that the exergy loss and the exergy efficiency were directly proportional to the values of solar irradiance and air mass flow rates. At solar noon, the maximum values for exergy change were 127 and 89 W/m² for air mass flow rates of 0.011 and 0.059 kg/s, respectively