Design of a sloped solar chimney power plant powered by industrial waste heat

B Chansawang, and A Koonsrisuk[*]

School of Mechanical Engineering, Institute of Engineering, Suranaree University of Technology, Muang District, Nakhon Ratchasima 30000, Thailand

* Corresponding Author: atit@sut.ac.th

Abstract. The solar chimney power plant (SCPP) generates electricity through the use of solar thermal power. The sloped solar chimney power plant (SSCP) is a variation of the SCPP, and its investment cost is lower than those of SCPPs. This study developed a mathematical model for designing a sloped solar chimney power plant powered by industrial waste heat (SSCPP-WH). The model was justified by validation using experimental data. It was found that the optimal area ratio between collector inlet and collector outlet (AR12) for SSCPP and SSCPP-WH are 2 and 14, respectively. It was also found that the collector efficiency of SSCPP-WH decreases with the increase of the waste heat and collector area. Furthermore, it was found that the optimum ground slope depends on the magnitude of the waste heat supplied.

Keywords: Solar chimney power plant; sloped collector; Solar energy; Waste heat recovery.