World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Simulation of Improving the Efficiency of a Fire-Tube Steam Boiler

Authors : Roudane Mohamed

Abstract : In this study we are interested in improving the efficiency of a steam boiler to 4.5T/h and minimize fume discharge temperature by the addition of a heat exchanger against the current in the energy system, the output of the boiler. The mathematical approach to the problem is based on the use of heat transfer by convection and conduction equations. These equations have been chosen because of their extensive use in a wide range of application. A software and developed for solving the equations governing these phenomena and the estimation of the thermal characteristics of boiler through the study of the thermal characteristics of the heat exchanger by both LMTD and NUT methods. Subsequently, an analysis of the thermal performance of the steam boiler by studying the influence of different operating parameters on heat flux densities, temperatures, exchanged power and performance was carried out. The study showed that the behavior of the boiler is largely influenced. In the first regime (P = 3.5 bar), the boiler efficiency has improved significantly from 93.03 to 99.43 at the rate of 6.47% and 4.5%. For maximum speed, the change is less important, it is of the order of 1.06%. The results obtained in this study of great interest to industrial utilities equipped with smoke tube boilers for the preheating air temperature intervene to calculate the actual temperature of the gas so the heat exchanged will be increased and minimize temperature smoke discharge. On the other hand, this work could be used as a model of computation in the design process.

Keywords : numerical simulation, efficiency, fire tube, heat exchanger, convection and conduction
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020