

Experimental Analysis of the Plate-on-Tube Evaporator on a Domestic Refrigerator's Performance

Authors : Mert Tosun, Tuğba Tosun

Abstract : The evaporator is the utmost important component in the refrigeration system, since it enables the refrigerant to draw heat from the desired environment, i.e. the refrigerated space. Studies are being conducted on this component which generally affects the performance of the system, where energy efficient products are important. This study was designed to enhance the effectiveness of the evaporator in the refrigeration cycle of a domestic refrigerator by adjusting the capillary tube length, refrigerant amount, and the evaporator pipe diameter to reduce energy consumption. The experiments were conducted under identical thermal and ambient conditions. Experiment data were analysed using the Design of Experiment (DOE) technique which is a six-sigma method to determine effects of parameters. As a result, it has been determined that the most important parameters affecting the evaporator performance among the selected parameters are found to be the refrigerant amount and pipe diameter. It has been determined that the minimum energy consumption is 6-mm pipe diameter and 16-g refrigerant. It has also been noted that the overall consumption of the experiment sample decreased by 16.6% with respect to the reference system, which has 7-mm pipe diameter and 18-g refrigerant.

Keywords : heat exchanger, refrigerator, design of experiment, energy consumption

Conference Title : ICHTFM 2019 : International Conference on Heat Transfer and Fluid Mechanics

Conference Location : Paris, France

Conference Dates : August 27-28, 2019