

Investigating the Effect of Different Design Factors on the Required Length of the Ambient Air Vaporizer

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Abstract : In this study, MATLAB engineering software was used in order to model an industrial Ambient Air Vaporizer (AAV), considering combined convection and conduction heat transfers from the fins and the tube. The developed theoretical model was then used to investigate the effects of various design factors such as gas flow rate, ambient air temperature, fin thickness and etc. on total vaporizer 's length required. Cryogenic liquid nitrogen was selected as an input fluid, in all cases. According to the results, increasing the inlet fluid flow rate has direct linear effect on the total required length of vaporizer. Vaporizer's required length decreases by increasing the size of fin radius or size of fin thickness. The dependency of vaporizer's length on fin thickness' size reduces at higher values of thickness and gradually converge to zero. For low flow rates, internal convection heat transfer coefficient depends directly on gas flow rate but it becomes constant, independent on flow rate after a specific value. As the ambient air temperature increases, the external heat transfer coefficient also increases and the total required length of vaporizer decreases.

Keywords : heat exchanger, modeling, heat transfer, design

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