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Optimization of Fin Type and Fin per Inch on Heat Transfer and Pressure Drop of an Air Cooler

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Abstract : Operation enhancement in an air cooler (heat exchanger) depends on the rate of heat transfer, and pressure drop. In this paper, for a given heat duty, study of the effects of FPI (fin per inch) and fin type (circular and hexagonal fins) on two parameters mentioned above is considered in an air cooler in Iran, Arvand petrochemical. A program in EES (Engineering Equations Solver) software moreover, Aspen B-JAC and HTFS+ software are used for this purpose to solve governing equations. At first the simulated results obtained from this program is compared to the experimental data for two cases of FPI. The effects of FPI from 3 to 15 over heat transfer (Q) to pressure drop ratio (Q/Δp ratio). This ratio is one of the main parameters in design, rating, and simulation heat exchangers. The results show that heat transfer (Q) and pressure drop increase with increasing FPI (fin per inch) steadily, and the Q/Δp ratio increases to FPI = 12 (for circular fins about 47% and for hexagonal fins about 69%) and then decreased gradually to FPI = 15 (for circular fins about 5% and for hexagonal fins about 8%), and Q/Δp ratio is maximum at FPI = 12. The FPI value selection between 8 and 12 obtained as a result to optimum heat transfer to pressure drop ratio. Also by contrast, between circular and hexagonal fins results, the Q/Δp ratio of hexagonal fins more than Q/Δp ratio of circular fins for FPI between 8 and 12 (optimum FPI).

Keywords : air cooler, circular and hexagonal fins, fin per inch, heat transfer and pressure drop
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