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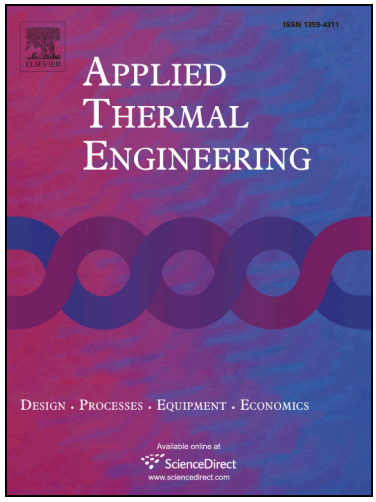

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Unsteady Forced Convection over Cylinder with Radial Fins in Cross Flow

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Abstract

The effect of adding straight fins on thermal and hydraulic characteristics of transient heat and fluid flow over a circular cylinder is investigated using the OpenFOAM toolbox. Simulations are conducted at Reynolds numbers of 100, 112.5, 125, 137.5, 150, 200, and the dimensionless fin height of 0.15, 0.35, 0.75, 1.5. It is found that in spite of flow over naked circular cylinder, which has one dominant vortex shedding frequency, in the case of finned cylinder some minor frequencies appear. The appearance of secondary peaks which originates from the existence of sharp edges in the geometry makes it possible to capture the lock-on phenomenon in several frequencies. It is computed that the mean drag coefficient increases as the fins are lengthened, and decreases as the number of fins is enhanced. Also, it is found that the average Nusselt number faces a decrease with the increase the number of fins. Finally, the best Nu/C_d ratio was obtained for the case with 2 parallel-flow horizontal fins. Also, the fin effectiveness has been calculated for cylinder with different number and heights of fins in various Reynolds numbers, and

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