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EFFECT OF INCLINED VORTEX GENERATORS ON HEAT TRANSFER ENHANCEMENT IN A THREE-DIMENSIONAL CHANNEL

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Three-dimensional unsteady flow and heat transfer in a channel with inclined block shape vortex generators mounted on one side of a channel flow are investigated for different Reynolds numbers, $\mathbf{Re}_H = 400-1500$, ***and*** $\mathbf{Pr} = 0.71$. ***This study was informed to gain an understanding of the flow phenomena and calculate the heat transfer and pressure drop for different Reynolds numbers. The effect of computational domain, angle of incidence, size of the vortex generator, and the discretization schemes on the results are also investigated. Simulations use an incompressible finite volume code, based on a fractional step technique with a multigrid pressure Poisson solver and a nonstaggered grid arrangement.***

INTRODUCTION

The subject of heat transfer enhancement is relevant to the design of more compact and less expensive heat exchangers with high energy performance. Compact heat exchangers are used in power and process industrial applications, such as the automotive industry and air-conditioning, electronic cooling, spacecraft, and aircraft applications. Different mechanisms such as the creation of electric or acoustic fields, surface vibration, fluid additive, and use of a special surface geometry may be employed for heat transfer enhancement, which can be classified into two groups: main flow and secondary flow enhancement [1]. The mechanisms of these different methods often are based on creating developing boundary layers, swirl or vortices, and stimulating flow destabilization or turbulence intensification [2–4]. One common method widely used for heat transfer enhancement is to employ heat transfer surfaces that are periodically interrupted along the streamwise direction. Some typical examples of such surfaces are louvered fin, offset fin, offset strip fin, and rectangular plate fin [5–11]. Another common method for enhancing heat transfer is to apply vortex generators such as fins, ribs, wings, and so on [2–4, 12]. The vortex generators are special surfaces that are used to generate secondary flow or vortices by swirling and destabilizing the flow. In addition, these vortices have a tendency to last for

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