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Flow-Induced Vibration of a Reed in a Channel: Effect of Reed Shape on Convective Heat Transfer with Application to Electronic Cooling[1] AARON RIPS, KOUROSH SHOELE, Johns Hopkins University, ARI GLEZER, Georgia Institute of Technology, RAJAT MITTAL, Johns Hopkins University — Flow-induced vibration of a reed (a thin plate or flag) in a channel can improve heat transfer efficiency in forced convection applications, allowing for more heat transfer for the same fan power. Such systems have wide ranging applications in electronic and power cooling. We investigate the effect of 3D reed shape on heat transfer enhancement. To study 3D effects, we first use 2D fluid-structure interaction (FSI) simulations of an optimized reed (in terms of mass and stiffness) to generate a prescribed reed motion. We then apply that motion to a pseudo 3D reed (i.e. infinitely stiff in the spanwise direction) and study the heat transfer enhancement in a 3D channel. This method allows us to explore a large parameter space exhaustively, and using this method, we examine the effect of several parameters, such as reed planform and spanwise gap, on the heat transfer enhancements for forced convection in a channel. Simulations indicate that these geometrical feature have a significant effect on the vortex dynamics in the wake as well as the heat transfer efficiency.

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