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Experimental Investigation of Transport Enhancement in Convective Air Flow by the Use of a Vortex Promoter YOGESH JALURIA, Rutgers Univ, KEVIN GOMES, GE Company — This paper focuses on the effect of placing a passive vortex generator in a flow and the resulting increase in transport rates. The flow circumstance considered is that of a flat plate with protruding heat sources, placed in a uniform flow, with a vortex generator located upstream of the leading edge. The study consists of three parts. In the first part, the flow due to the vortex promoter by itself is considered. The periodic or chaotic behavior in the wake behind the promoter is investigated. By studying different sizes and shapes of vortex promoters, it is determined which configuration offers the largest disturbance in the flow and the frequency at which it occurs. In the second part of the study, the flow over a plate with isolated, finite-sized, protruding heat sources, without a vortex promoter, is considered. Again, the frequency of the disturbance downstream is investigated to determine the nature of the resulting flow and the disturbance frequency. The effect of varying the dimensions and locations of the heat sources on the flow downstream is investigated. It is found that a larger separation distance between two sources leads to higher transport rates. In the last part of the study, tests are done for the combination of vortex promoter and the plate, placing a vortex promoter in front of the plate. An effort is made to match the frequencies of the disturbances due to the vortex generator with those due to the plate in an attempt to achieve resonance. From these results, an optimal promoter is chosen that would lead to maximum heat transfer rate.

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