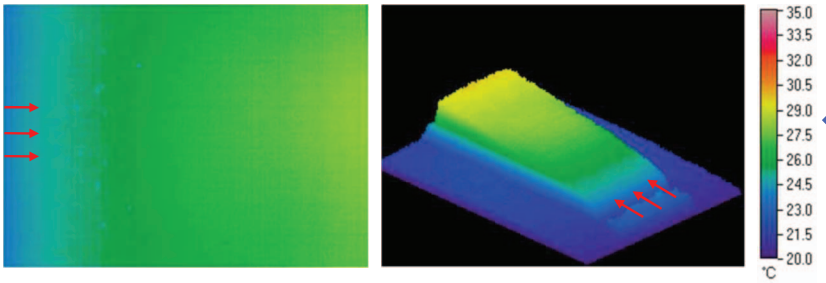
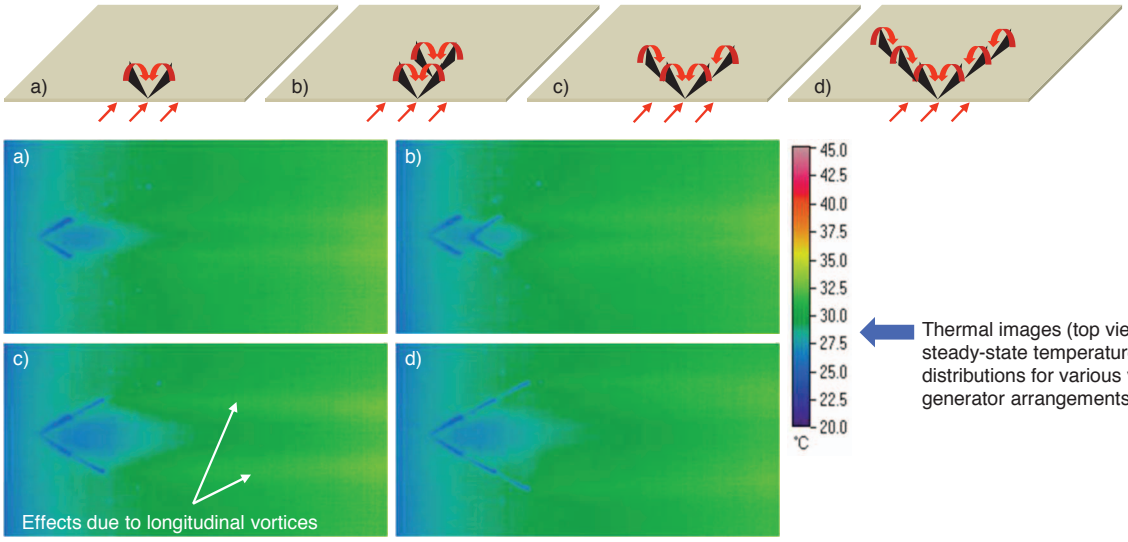
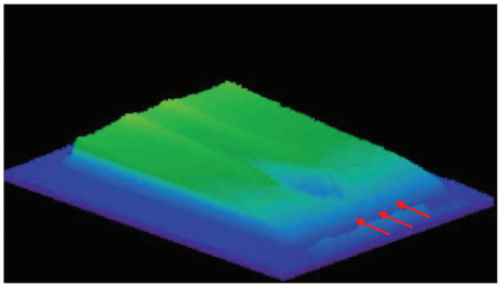


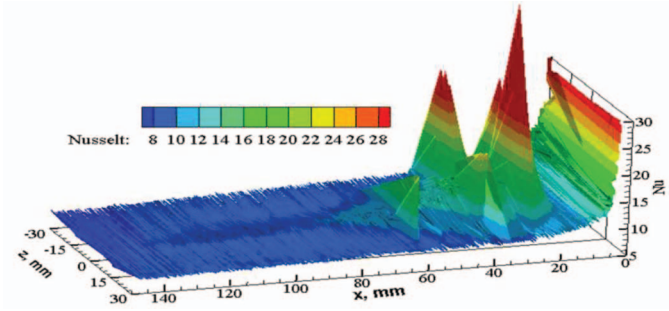
2D (left) and 3D (right) representation of thermal boundary layer development in a laminar developing channel flow



Thermal images (top view) of the steady-state temperature distributions for various vortex-generator arrangements



3D thermal image of the steady-state temperature distribution for the two-pair V-formation array



Computed local Nusselt number distribution

Investigation of Surface Convection Enhancement by a V-Formation Winglet Array Using Infrared Thermography

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Vortex generation is a promising method for air-side heat transfer enhancement. The enhancement mechanisms are well established as boundary layer modification, bulk fluid mixing and flow destabilization. Inspired by group movement of migrating birds, a novel vortex generator (VG) array deployed in a "V" is proposed, aiming to promote constructive interference between vortices and improve VG performance. Its impact on surface convection enhancement is experimentally evaluated in a developing channel flow using infrared thermography. The proposed V-array demonstrates superiority to a conventional multi-row configuration in that it affects a larger heat transfer area, and the boost effect by the trailing pair is manifest even at relatively small Reynolds numbers. The experimental results suggest that a two-pair V-array deployed at 30° is an appropriate design for implementation in prototype plain-fin heat exchangers.

