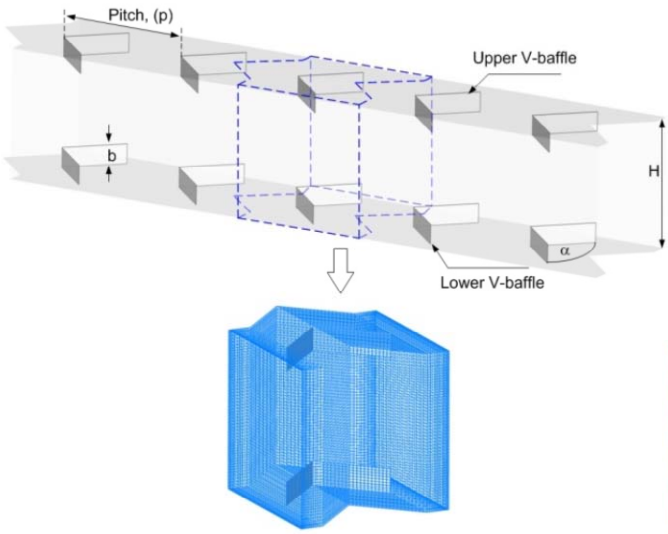

Figure 1. Computational domain of periodic flow model

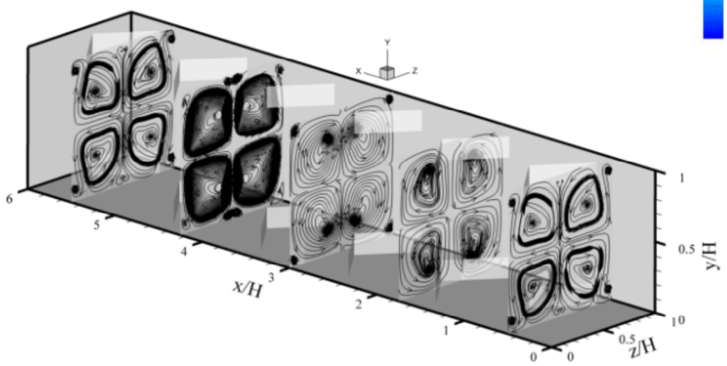

Figure 2. Predicted streamlines in transverse planes

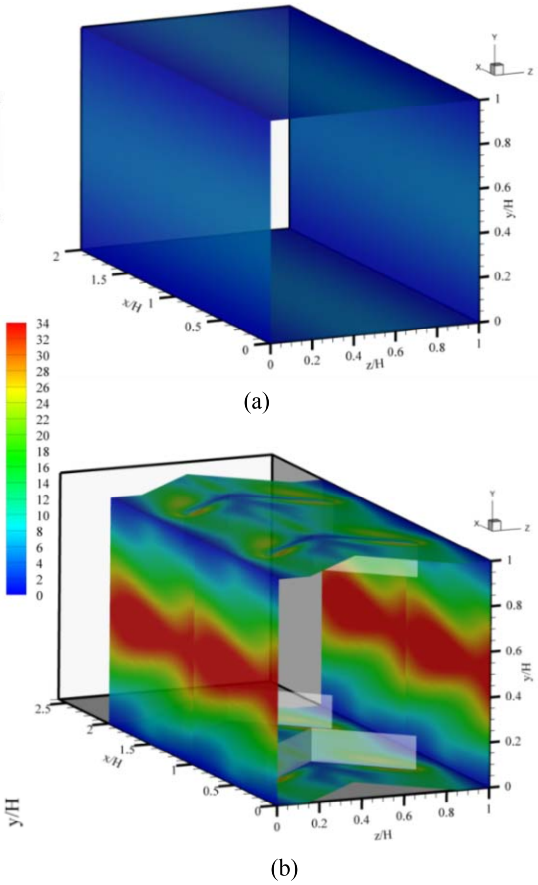

Figure 3. Nu_x Contours for (a) smooth duct and (b) ribbed duct

FLOW STRUCTURE AND HEAT TRANSFER IN SQUARE DUCT WITH 45⁰ V-RIBS

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The system of interest and flow structure in the duct mounted periodically with V-ribs on the lower and upper walls can be displayed by considering the streamline plots in transverse planes for using the 45° V-ribs at Re = 800 as depicted in Figs. 1 and 2. The counter-rotating vortex flows created by the 45° V-ribs exist on the left and right sides of the duct that can help to induce impinging flows on both side walls leading to drastic increase in heat transfer rate over the tested duct. The local Nu_x contours on the duct wall is presented in Fig. 3a for smooth duct while that with the 45° V-ribs at b/H = 0.15 is showed in Fig. 3b. In the figure, it is apparent that the higher Nu_x regions over the walls are seen to be in a larger area, except for four corner regions and some central area on the upper and lower walls while the Nu_x of the smooth duct is uniform and very low. The Nu_x peaks are observed at the impingement areas on the left and right sidewalls attached to the rib leading end. This indicates a merit of employing the 45°V-rib over the smooth duct with no rib for enhancing the heat transfer rate.