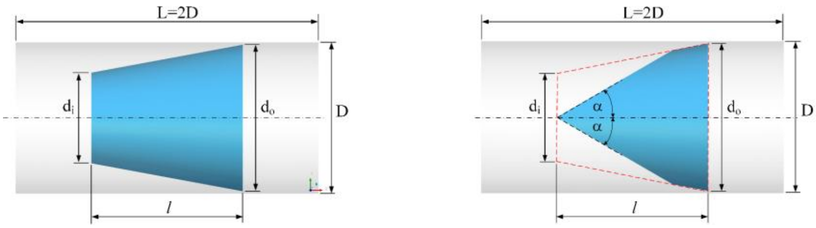
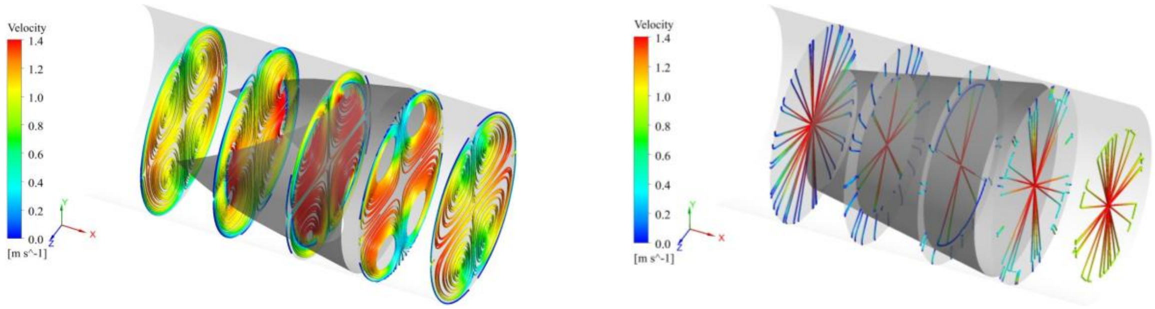


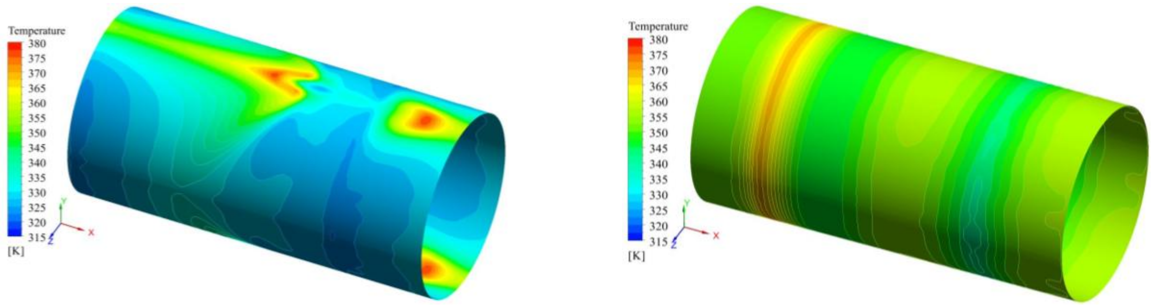
(a) (b)

Figure 1. Conical ring arrangements (a) typical and (b) wedge-shaped conical rings.



(a) (b)

Figure 2. Streamlines in transverse planes for (a) wedge-shaped ring and (b) conical ring.



(a) (b)

Figure 3. Temperature contours for the tubes with (a) wedge-shaped ring and (b) typical ring at Re=3000.

NUMERICAL HEAT TRANSFER INVESTIGATION IN A ROUND TUBE WITH WEDGE-SHAPED CONICAL-RINGS

S. TAMNA[1], N. KOOLNAPADOL[2] and S. SRIPATTANAPIPAT[3]

[1] Department of Automotive Engineering, Faculty of Engineering, Thai-Nichi Institute of Technology, Bangkok, Thailand

[2] Department of Automotive Mechanical Engineering, Faculty of Industrial Technology, Rajabhat Rajanagarindra University, Chachoengsao, Thailand

[3] Department of Mechanical Engineering, Faculty of Engineering, Mahanakorn University of Technology, Bangkok, Thailand

The flow structure and vortex coherent in a flow model fitted with wedge-shaped and typical conical rings for D_{Ri} = 0.6, D_{Ro} = 0.97 at Re = 3000 can be depicted in the form of the streamlines in transvers planes and the temperature contours as shown in Figs. 2a-2b and 3a-3b, respectively. In Fig.2a, the wedge-shaped ring induces two main counter-rotating vortices assisting to induce impinging jets over certain regions of the tube wall. However, vortex is not found in the tube with the typical ring (Fig. 2b). Apparently the temperatures on the tube wall equipped with the wedge-shaped ring are mostly low, reflecting high Nu_x (Fig. 3a). The lowest temperature region is found at the impingement area on the tube surface where the outlet ring attached. This indicates that wedge-shaped ring effectively enhances heat transfer. On the other hand, the temperatures on the tube wall equipped with the typical ring is high, especially along the perimeter around the inlet region.