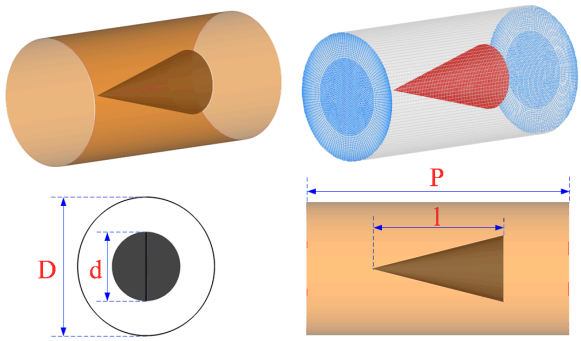
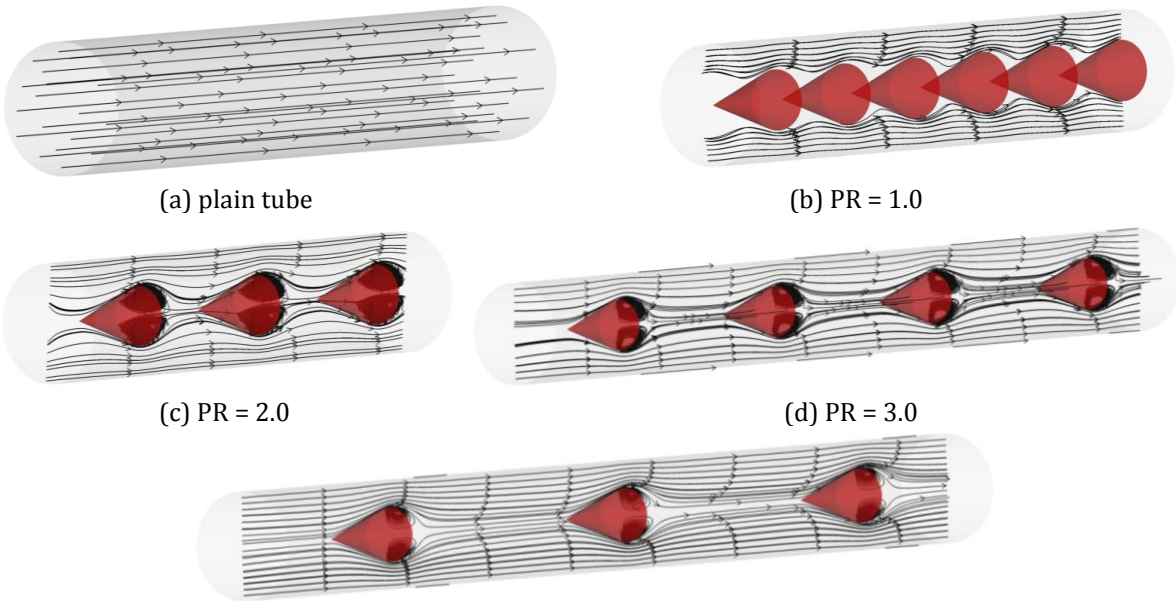


Figure 1. Grid arrangement for tube with V-cone inserts.



(a) plain tube (b) PR = 1.0

(c) PR = 2.0 (d) PR = 3.0

(e) PR =4.0

Figure 2. Contour plots of streamline across tubes with V-cone inserts.

SIMULATION OF TURBULENT HEAT TRANSFER IN A TUBES EQUIPPED WITH V-CONE TURBULATOR

A. SAYSROY[1], V. SHUWATTANAKUL[2] and P. PROMTHAISONG[3]

[1] Faculty of Industrial Technology, Phetchaburi Rajabhat University, Phetchaburi, Thailand

[2] Department of Food Engineering, Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

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

The details of circular tubes fitted with V-cone turbulators are presented in Fig. 1. The distance between the V-cone pitch length to tube diameter (P/D = 1.0, 2.0, 3.0 and 4.0) was examined. All V-cone turbulators have the same diameter ratio (d/D) of 0.5 and all tubes have the same diameter. The tube wall is subjected to a constant temperature wall heating condition at 310 K. The simulation is carried out for Reynolds number (Re) of 5000 using air as the working fluid. Figure 2 demonstrated the contour plots of streamline in circular tube equipped with V-cone turbulators at different pitch ratios (P/D = 1.0, 2.0 and 3.0). Turbulence flow stream lines regarding to V-cone geometries are observed in the tubes with all V-cone inserts while only straight stream lines are seen in the plain tube. It is also depicted that the V-cone turbulator gives more consistent turbulence than those the plain tube alone. For V-cone inserts, turbulent consistency become higher and its intensity becomes stranger as pitch ratio (P/D) decreases. It can also be found high turbulence due to flow fluctuation is seen around V-cone turbulators especially at the lower pitch ratio (P/D = 1.0 and 2.0).