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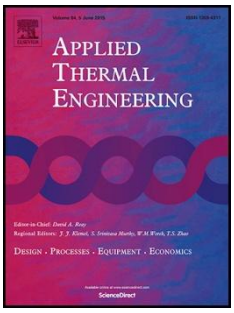

Title: A numerical study on thermal-hydraulic characteristics of turbulent flow through a circular tube fitted with pipe inserts

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A numerical study on thermal-hydraulic characteristics of turbulent flow through a circular tube fitted with pipe inserts

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Highlights

- A new type of pipe inserts is developed in this paper
- Pipe insert can achieve a high heat transfer rate by changing the velocity profiles and temperature profiles in the tube.
- The heat transfer coefficient decreases with increase in spacer length.
- It is valuable to adopt a mounting angle between inserts nodes
- Four pipes inserts have a better heat transfer performance than three pipes inserts.

Abstract A numerical investigation is carried out for turbulent flow in a circular tube with pipe inserts. Pipe inserts with different node installation is carefully investigated at the Reynolds number range of 2892-28915. Liquid water is used as the working fluid. The results show that the pipe inserts has an excellent heat transfer performance in the turbulent regime. The heat transfer rate decreases with the increase in spacer length. However, the flow resistance increases with the decrease in spacer length. Therefore, a suitable spacer length has to be taken into consideration in the design of heat exchanger. Compared with three pipes inserts, four pipes inserts have a better heat transfer performance, especially at high Reynolds number. The maximal PEC (Performance evaluation criterion) values resulted by four pipes inserts were approximately 1.4-3.0. Heat transfer performance of pipe inserts is also affected by the installation angle between inserts node. Although installation angle has a limited impact on the heat transfer rate, the friction factor increase is also very low. It is still valuable to adopt an installation angle for heat transfer enhancement.