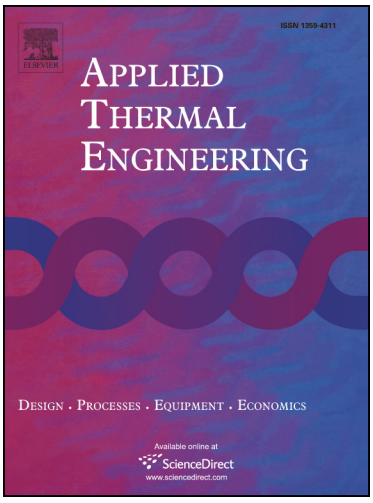

Research Paper

Experimental study on heat transfer characteristics in a ribbed channel with dimples, semi-spherical protrusions, or oval protrusions

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Experimental study on heat transfer characteristics in a ribbed channel with dimples, semi-spherical protrusions, or oval protrusions

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Highlights

- ✓ Study on the heat transfer augmentation of a ribbed channel using dimple or protrusion
- ✓ Detailed distribution of the heat transfer coefficient was obtained using the transient heat transfer measurement technique with IR camera
- ✓ The case with lower protrusions showed a higher heat transfer augmentation and thermal performance factor than the case with higher semi-spherical protrusions
- ✓ The dimples were more effective in the heat transfer augmentation in the ribbed channel, while the pressure loss was higher than that for the protrusion cases.

Flow turbulators such as ribs, dimples, and protrusions induce high flow disturbance, and as a result, enhance the heat transfer coefficient. For higher heat transfer augmentation, two or more heat transfer enhancement methods can be applied simultaneously. For the present study, dimples or protrusions in various shapes were installed in a channel with angled ribs, and the effects of the protrusion configurations on the heat transfer coefficient and thermal performance were experimentally investigated. The heat transfer coefficient was measured using the transient IR camera technique. The tested Reynolds numbers based on the channel hydraulic diameter were 30,000, 50,000, and 70,000. The channel aspect ratio and the hydraulic diameter were 2 and 0.0533 m, respectively. Both the height and thickness of the ribs were 5 mm, and the rib installation angle was 60°. Both the semi-spherical and oval protrusions were tested