

Documents

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Enhancement of convective heat transfer in smooth air channels with wall-mounted obstacles in the flow path: A review
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Abstract

The topic is of paramount importance. Heating, cooling, or solar air ducts are used in several sectors and in very diverse fields. The improvement in their performance has been and is still of major concern to theorists and practitioners. The issue of exchanging heat between fluid and the heated surfaces within a smooth air channel relies mainly on the value of the heat transfer coefficient. This coefficient is a mine of factors that affect the heat exchange between working fluid and heated walls. Therefore, it is an ambitious attempt to work on such a topic. Obstacles, such as staggered or in-line, transverse, or longitudinal baffles, fins, or ribs have long been utilized in several thermal systems like shell-and-tube heat exchangers with segmental baffles, compact heat exchangers, flat-plate solar air collectors, microelectronics, and various other industrial applications, because of their high thermal loads and reduced structural parameters. The channels, through which the cooling or heating fluid is supplied, are generally mounted with several obstacles in order to increase the cooling or heating level. This configuration is mostly used in designing heat exchangers and solar air collectors. Through this contribution, we present a comprehensive literature review of the various heat transfer strategies used to improve the performance of smooth air channels (SACs). Various research works were made on (SACs) either numerical or experimental in order to improve their performance. Different models and configurations of obstacles are reviewed and discussed, including attached, semiattached, or detached; parallel, orthogonal or inclined; solid, perforated, or porous; and simple, corrugated, or shaped, of various sizes, positions, attack angles, perforations, porosities, arrangements, and orientations. In these studies, the obstacles are principally used to change the direction of the flow field, to modify the distribution of the local heat transfer coefficient, and also to increase the turbulence levels, thus resulting in larger heat transfer between the fluid and the heated walls. © 2018, Akadémiai Kiadó, Budapest, Hungary.

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