

A new design of plate-fin microchannel heat sink (MCHS) with trapezoidal cavities and oval pins with and without slots is proposed. Heat transfer and fluid flow characteristics are numerically studied and analyzed for Reynolds number ranging from 100 to 1200. Three geometric parameters have been considered in this study including; the aspect ratio of the oval pins, pin position from cavity center toward the inlet, and lastly thickness of the two inclined slots of the pins. The finite volume method (FVM) is adopted for solving the governing equations, and the SIMPLE algorithm is utilized for the computations. The overall performance of the present design is evaluated based on friction factor, Nusselt number and hydrothermal performance factor (PEC). The results indicate that the optimal design of the proposed design is at a pin aspect ratio of ( $AR = 1.25$ ), pin distance from cavity center of ( $x = 0.03$  mm) and slot thickness of ( $t = 0.008$  mm) which gives a maximum PEC of 1.37.