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Thermal Performance of Fully Immersed Server into Saturated Fluid Porous Medium

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Abstract : The natural convection cooling system of a fully immersed server in dielectric liquid is studied numerically. In present case study, the dielectric liquid represents working fluid and it is in contact with server inside capsule. The capsule includes electronic component and fluid, which can be modelled as saturated porous media. This medium follow Darcy flow regime and assumed to be in balance between its components. The study focus is on role of spatial parameters on thermal behavior of convective heat transfer. Based on server known unit, which is 1U, two parameters Ly and S are changed to test their effect. Meanwhile, wide range of modified Rayleigh number, which is 0.5 to 300, are covered to better understand thermal performance. Navier-Stokes equations are used to model physical domain. Furthermore, successive over relaxation and time marching techniques are used to solve momentum and energy equation. From obtained correlation, the in-between distance S is more effective on Nusselt number than distance to edge Ly by approximately 14%. In addition, as S increase, the average Nusselt number of the upper unit is increased sharply, whereas the lower one keeps on same level.

Keywords : convective cooling of server, darcy flow, liquid-immersed server, porous media
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