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Thermal Behavior of Wet Porous and Solid fin–Experimental and Analytical Approach

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Highlights

- Experimental facility has been developed to study the cooling and dehumidification phenomenon of air surrounding an extended surface (porous and solid fin) under controlled environmental conditions.
- The visual observation of the dehumidifying phenomenon in solid wet fins shows four stages which includes, larger droplets, very fine droplets, film like region and dry region. The porous fin (metal foam with high porosity) considered were found to have more condensate retention capacity and the maximum humidification occurs at the base. Due to the structure of the porous fin it is expected that they will be choking and fouling. While employing a porous fin this point needs to be kept in mind.
- Along with the experimental study, the porous and solid wet fin were analysed under simultaneous heat and mass transfer mechanisms using the Least Square method and other techniques. The differential equations which governs the fin temperature distribution were solved by using Least Square method and then the fin efficiency and effectiveness was calculated. In solid wet fin, along with LSM other techniques such as Finite difference, fully analytical and LSM has been applied.
- The obtained results were compared with the experimental results done on both porous and solid wet fin performed under controlled environmental conditions an excellent match have been observed. The fin surface temperature is higher in case of porous fin subjected to natural convection.

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