

Numerical determination of efficiency of dry circular fin

Abstract

Fins are usually employed in heat exchangers such as cooling coils and condensers to enhance the heat transfer between two unmixed fluids. The heat transfer enhancement results from the increase in the external surface area of the heat exchanger. The performance of fins is usually expressed as fin efficiency, defined as the ratio of the actual fin heat transfer to the maximum heat transfer if the whole fin was at the fin base temperature (Threlkeld, 1970). Analytical solution of efficiency of dry annular fins are reported in many handbooks (Kraus et al (2001), Incropera et al (1996). The solution is complex because it requires the calculation of modified Bessel functions of the first and second kind. Approximations are usually made to avoid the use of Bessel functions. Using Schmidt approximation, fin efficiency can be calculated within 0.01 of the exact value for efficiencies greater than 0.5 (Schmidt, 1949). Hong and Webb (1996) proposed a modification of the Schmidt equation for better accuracy. In this paper, a simple and accurate method is proposed.