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HOW GOOD IS GOODMAN'S HEAT-BALANCE INTEGRAL METHOD FOR ANALYZING THE REWETTING OF HOT SURFACES?

ABSTRACT

This paper discusses the application of heat-balance integral method for solving the conduction equation in a variety of rewetting problems. A host of rewetting problems for various geometry, convective boundary conditions and internal heat generation as well as for variable property has been solved by employing the method. Closed form expressions for rewetting velocity and temperature field in the hot solid have been obtained. Further, a unified solution methodology for different geometry and dimension of the problem has been derived. The results obtained agrees well with other analytical techniques namely, Winer-Hopf technique, separation of variables method as well as with the numerical ones. The predicted solutions exhibit a good agreement with experimental data as well. Additionally, an optimal linearization technique has been applied to analyze the effect of temperature dependent properties on the phenomena of rewetting. The results obtained and optimal linearization techniques have been compared and a good agreement has been obtained. All the studies made so far demonstrates the suitability of employing HBIM in the analysis of various rewetting problems

KEYWORDS

rewetting, quenching, heat balance integral method, effective Biot number, analytical methods, optimal linearization

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