Semi-infinite solid heat transfer limitation

ABSTRACT

One-dimensional semi-infinite heat transfer solution is a common solution for transient heat transfer experiments. This solution is valid for a short certain amount of time before the semi-infinite solid became invalid. Crank Nicolson solution has been chosen to address this issue. This paper reports the time limitation for semi-infinite solid solution and justify the usability of Crank Nicolson solution given the same boundary conditions. The flat plate heat transfer experiment has been conducted. With the same boundary conditions,at Fourier number 0.1,the resultant heat transfer coefficient and adiabatic wall temperature have shown a good agreement between the semi-infinite solid solution and the Crank Nicolson solution. Beyond this Fourier number, both solutions have given inaccurate results. The inaccurate results are due to unsuitable boundary conditions. Future work will involve modification of the back face boundary conditions to address the time limitation of the one-dimensional semi-infinite solid heat transfer solution.