

Steady state finite element analysis of a double stack cold plate with heat losses

Abstract

A generalised formulation of the steady state analysis of a double stack cold plate, with and without heat losses from their top and bottom surfaces using dimensionless parameters, is carried out. Galerkin's weighted residual method is employed to obtain the finite element formulation of the governing equation. A simple one-dimensional fin theory is applied to the discretised elements during the analysis. The analysis is divided into two parts: a single unit cell analysis and the analysis of the assembly of several number of unit cells. Results from the present analysis with a single unit cell for double stack cold plate without heat losses, compare well with those available in the literature. The analyses of the assembly of unit cells with heat losses from the top and bottom surfaces of the stack show that the single unit cell can be considered to be the representative of the stack only when there is no heat loss.

Keywords — Heat losses, equations of motion, stack cold plate, finite element method