

Abstract:

Air movement initiated by evaporator fans is generally considered to flow over and around fruit bins and through the runner spaces. Direct measurement of airflow velocities and patterns in fruit storage rooms is extremely difficult because flow is highly turbulent in some areas and uniform in others. Recent developments in Computational Fluid Dynamics (CFD) simulations have provided a valuable tool to predict air movement in many engineering applications (Agarwal, 1995; Anderson, 1995). The objective of this study was to simulate and predict airflow in an empty bin, over a bin and in the runner space of a bin using CFD methods. All three simulations were evaluated under incompressible flow with a uniform inlet velocity of 13 m/s. Two and three-dimensional simulations of turbulent flow were carried out by CFD codes using the standard high k -model. The SIMPLE (Semi-Implicit Method for Pressure-Linked Equations) method was used to determine the influence span-wise aspect ratio, grid size and time-step had on the results. This method iteratively solves the Navier-Stokes equations that compute velocity and pressure distributions, and continuity until convergence was achieved.