Expositor:

Nelson Moraga

Departamento de Ingeniería Mecánica, Facultad de Ingeniería, Universidad de La Serena

Título de la Charla:

Mathematical modeling and finite volume simulation of phase change problems

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Resumen:

Fluid mechanics and convective heat transfer in four applied engineering processes including phase change are investigated. The first example describes the water removal from grapes by a pre-heated air inside a solar dryer. Inlet air conditions are continuously changing with time. A porous non-Darcian diffusion-convective model is used to characterize the flow of air in contact with grapes and the coupled heat and mass convection inside an experimental dryer. The second application considers the cooling of lithium-ion polymer batteries of a solar racing car by using different arrays of phase change energy materials. In the third case injection of melted aluminum inside a mold is studied by a $k - \varepsilon$ turbulent model along a volume of fluid VOF model. Finally, time fluctuations of air temperature inside a house caused by external variations of solar radiation, external air temperature and wind velocity are reduced by a liquid-solid phase change material located inside two vertical walls and in the roof. Conjugate convective-diffusive mathematical models are built for each problem based on continuity, linear momentum and energy non-linear coupled partial differential equations. The finite volume method FVM along suitable pressure-velocity-temperature coupling sequential algorithm allow an implicit iterative solution of the system of discretized equations. Results for the evolution of velocity, pressure and temperature in each one of the four problems are described and discussed.

CENTRO DE INVESTIGACIÓN EN INGENIERÍA MATEMÁTICA
Universidad de Concepción

DEPARTAMENTO DE MATEMÁTICA Y FÍSICA APLICADAS
Universidad Católica de la Santísima Concepción

Informaciones: `ggatica@ci2ma.udec.cl` / `jecamano@ucsc.cl` / `lgatica@ucsc.cl`