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Running Title: **Dynamic Simulation of Plate Pasteurizer: Model and Validation**

Abstract:

Continuous pasteurization is a thermal processing of fluid foods that targets the inactivation of microorganisms and enzymes that compromise food safety and product shelf life. A physical model based on conservation and transport equations is derived for the simulation of the dynamic operation of a plate pasteurizer unit that comprises three plate heat exchangers (heating, cooling and heat regeneration) and a non-isothermal holding tube. The mathematical model consists of a system of differential equations with boundary and initial conditions, which is solved numerically using a finite difference method. In order to test and validate the model, it was applied to the study of the dynamic behavior of a laboratory scale unit for the start-up operation and for disturbances on the process flow rates (product, heating fluid and cooling fluid). Temperatures were experimentally acquired in twelve positions along the processing unit. Through the comparison of experimental and simulated results, it was verified that the predictions from the model were in good agreement with experimental data under various operating conditions. The developed model provides a virtual unit that is useful to test operational policies and process controllers.

Keywords: Pasteurization; Plate heat exchanger; Mathematical modeling; Dynamic simulation; Heat transfer.

Nomenclature

a_i model parameter, $i = \{1, 2, 3\}$ (–)

A heat transfer area (m^2)

A_c cross-section area for channel flow (m^2)