

## Accepted Manuscript

Dynamic Simulation of a Plate Pasteurizer Unit: Mathematical Modeling and Experimental Validation

Carola G.C.C. Gutierrez, Gabriel N. Diniz, Jorge A.W. Gut

PII: S0260-8774(14)00058-2

DOI: <http://dx.doi.org/10.1016/j.jfoodeng.2014.01.029>

Reference: JFOE 7711

To appear in: *Journal of Food Engineering*

Received Date: 16 July 2013

Revised Date: 18 October 2013

Accepted Date: 27 January 2014

Please cite this article as: Gutierrez, C.G.C., Diniz, G.N., Gut, J.A.W., Dynamic Simulation of a Plate Pasteurizer Unit: Mathematical Modeling and Experimental Validation, *Journal of Food Engineering* (2014), doi: <http://dx.doi.org/10.1016/j.jfoodeng.2014.01.029>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



## Dynamic Simulation of a Plate Pasteurizer Unit: Mathematical Modeling and Experimental Validation

Carola G. C. C. Gutierrez, Gabriel N. Diniz, Jorge A. W. Gut\*

University of São Paulo, Escola Politécnica, Department of Chemical Engineering, P.O.Box 61548, São Paulo, SP, 05424-970, Brazil

\* Corresponding author. Tel.: +55 11 30912253. *E-mail address*: jorgewgut@usp.br (J.A.W. Gut).

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 ( $\text{m}^2$ )  
 $A_c$  cross-section area for channel flow ( $\text{m}^2$ )

Download English Version:

<https://daneshyari.com/en/article/6665896>

Download Persian Version:

<https://daneshyari.com/article/6665896>

[Daneshyari.com](https://daneshyari.com)