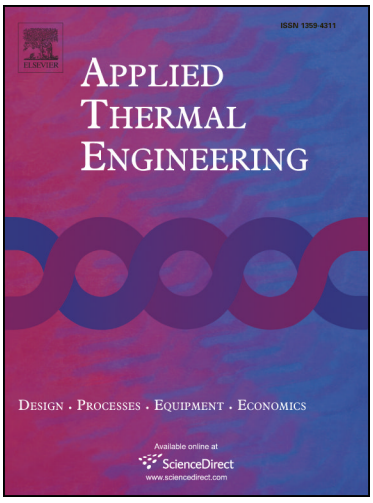

Research Paper

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Merlin Simo-Tagne, André Zoulalian, Romain Rémond, Yann Rogaume

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MATHEMATICAL MODELLING AND NUMERICAL SIMULATION OF A SIMPLE SOLAR DRYER FOR TROPICAL WOOD USING A COLLECTOR

Merlin Simo-Tagne[1*], André Zoulalian[2], Romain Rémond[3], Yann Rogaume[3]
[1]LERMaB, ENSTIB, 27 rue Philippe Séguin, PO Box 1041, F-88051 Epinal, France
[2]University of Lorraine, LERMaB, Faculty of Sciences and Techniques, PO Box 239–54560, Vandoeuvre-les-Nancy, France
[3]University of Lorraine, LERMaB, ENSTIB, 27 rue Philippe Seguin, PO Box 1041, F-88051 Epinal, France
[*]Corresponding author. E-mail: simotagne2002@yahoo.fr

Abstract:

The main objective of this paper is to develop a computational model and to simulate the drying of timber with a solar dryer. Two sets of equations have been established: one for the solar collector and the other for the drying chamber. The computed and measured outlet temperatures of the solar collector were compared. A very satisfactory prediction by the model is observed. The theoretical variations of the relative humidity and temperature of the air inside the drying chamber were computed and the analyses gave satisfactory physical meanings. The drying kinetic is a little faster. Using the solar collector, the final moisture content of the wood stack of iroko species (*Chlorophora excelsa*) is lower than the one obtained without utilization of the solar collector. The proposed modelling can be used to design and model other solar dryers.

Keywords: Solar dryer; solar collector; mathematical modelling; wood; Epinal; Yaoundé.

1.Introduction:

Reducing and optimizing the rate of energy use in industry is an urgent requirement. In effect, it is recommended that there should be several methods of improving the performance of the process and optimizing the energy needed. New technologies such as those that use renewable energies could be widely used in the context of protecting the environment and reducing greenhouse gas emissions. According to Zhao et al. [1], wood drying is a complicated process and more than 80% of lumber production uses conventional drying, where hot and wet air flows through the stacked lumber by forced circulation. Solar wood drying offers an alternative method of drying timber using renewable energy sources. Simultaneous heat and mass transfer