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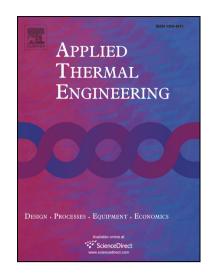
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ACCEPTED MANUSCRIPT

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

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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

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