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Data Article

Data on the no-load performance analysis of a tomato postharvest storage system

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A R T I C L E I N F O

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A B S T R A C T

In this present investigation, an original and detailed empirical data on the transfer of heat in a tomato postharvest storage system was presented. No-load tests were performed for a period of 96 h. The heat distribution at different locations, namely the top, middle and bottom of the system was acquired, at a time interval of 30 min for the test period. The humidity inside the system was taken into consideration. Thus, No-load tests with or without introduction of humidity were carried out and data showing the effect of a rise in humidity level, on temperature distribution were acquired. The temperatures at the external mechanical cooling components were acquired and could be used for showing the performance analysis of the storage system.

Specifications Table

Subject area	*Mechanical Engineering*
More specific subject area	*Machine design, heat transfer and thermo-fluid engineering*
Type of data	*Table, text file, Graph*

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How data was acquired	*The tomato postharvest storage system was designed and constructed using the principle of vapour compression refrigeration system. The external temperatures of the compressor, condenser, evaporator and expansion valve, and the internal temperature distribution of the system's chamber were measured with k-type thermocouples and a digital hygrometer was used to measure the humidity in the system. The refrigerant charge and discharge pressures were acquired by a Sigma® testing manifold*
Data format	*Raw, Analyzed*
Data source location	*Department of Mechanical Engineering, Covenant University, Ota Ogun State, Nigeria.*
Experimental factors	*The Walls of the storage system was wet with water to introduce humidity into the system before the No-load, humidity introduction test was performed.*
Experimental features	*No-load tests, were carried out on the designed tomato postharvest storage system for a test period of 96 h, at a 30 min interval. The tests were divided into No-load test with and without humidity introduction. The data acquired were compared to determine the effect on the temperature pull down time at different locations in the storage system, when humidity level is raised.*
Data accessibility	*Data are available within this article*

Value of the data

- The given dataset should show researchers the correlation between the external temperatures of the mechanical components (compressor, evaporator, expansion valve and condenser) of the cooling system and this could be used in determining the coefficient of performance and exergy of the system.
- The dataset for the temperature distribution within the system's chamber can be employed to determine the air flow pattern, and also determine the impact the system has on the stored tomato. This could further aid in the computational fluid dynamics analysis of temperature distribution within the system's chamber.
- The data can be used to investigate the effect of relative humidity on the pull-down time at different locations in the storage system.
- The dataset could be used in investigating the effect of the evaporator position on the warm and cold zone in a system that uses natural convection method of heat transfer.

1. Data

The temperatures at the compressor, evaporator, expansion valve and condenser were collected and a set of experimental data was generated. Temperature interaction between the evaporator and air at the top, middle and bottom of the cooling system were collected at 30 min time interval. The No-load experiments were each run twice and the average taken as representative data for better accuracy. Also, data showing the pressure of the refrigerant at the suction and at the discharge of the compressor was gathered (Tables 1 and 2).

2. Experimental design, materials and methods

A 530 mm × 560 mm × 790 mm (width × depth × height) tomato postharvest storage system was designed and constructed as shown in Fig. 1. The principle of the vapour compression refrigeration system was employed by using a 1/10 aspera R600a compressor, 1/10 air cooled condenser, 1/10 plate and tube evaporator and capillary tube of 0.91mm internal diameter and length 3442 mm, used to control the internal environmental condition of the system. The capacities of the mechanical cooling components were chosen based on the design calculations [1]. The evaporator was positioned within