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DETERMINATION OF THE EXISTENCE OF A REGULAR THERMAL REGIME IN POULTRY WASTE

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Abstract

The system "environment (water in an annular volume) - a thin cylindrical metal wall - the investigated liquid medium" is being studied. Heat exchange during heating and cooling of water-diluted chicken litter under conditions of forced convection is studied. Chicken droppings represent a multiphase medium, as it consists of solid particles based on a liquid medium.

After conducting an analysis of the distribution of excess temperature over time $Ln\vartheta=f(\tau)$ during the study of heat exchange of chicken litter under the conditions of its cooling and heating, a linear rate of cooling (heating) m=const was determined, which is characteristic of a regular thermal regime during cooling (heating) of a solid body (system of solid bodies) and maintaining the stability of the ambient temperature.

Key words: regular thermal regime, substrate, biogas plant, heat exchange equipment, thermal stabilization, thermophysical properties, experimental and calculation method, mathematical model.

Introduction

The development of the poultry industry leads to a high concentration of birds in a limited area, which contributes to the growth of the arrival and accumulation of large volumes of bird droppings in the territories of poultry farms, in ravines, near rivers and settlements, creating an ecological hazard for people, flora and fauna.

The purpose of the work: to investigate the rate of cooling (heating) in poultry waste during forced convection.

Research results

The system "environment (water in an annular volume) - a thin cylindrical metal wall - the investigated liquid medium" is being studied. Heat exchange during heating and cooling of water-diluted chicken litter (hereinafter referred to as chicken litter) under conditions of forced convection is studied. Chicken droppings represent a multiphase medium, as it consists of solid particles based on a liquid medium.

Average temperatures are determined as arithmetic averages based on the results of temperature measurement by thermocouples on vertical thermoprobes at a certain point in time [1-2].

Processing is carried out by the method of stationary heat exchange, examining the entire time interval, taking the step $\Delta = 90$s and the time interval $\Delta\tau = \Delta\tau_1 = \Delta\tau_2 = ... \Delta\tau_n = 180$s [1-2].

Table 1

№	The number of revolutions of the stirrer per minute	Heat exchange process	Appearance function $Ln\vartheta=m\cdot\tau + C$	Coefficient of determination R^2
1	33	Heating	y = -0,002x + 3,2985	$R^2 = 0,9714$
2	114	Heating	y =-0,0029x + 3,774	$R^2 = 0,9979$
3	156	Heating	y =-0,0043x + 3,7055	$R^2 = 0,9948$
4	33	Cooling	y = -0,002x + 3,4258	$R^2 = 0,9636$
5	114	Cooling	y =-0,0041x + 3,5391	$R^2 = 0,9868$
6	156	Cooling	y =-0,0045x + 3,7809	$R^2 = 0,9946$

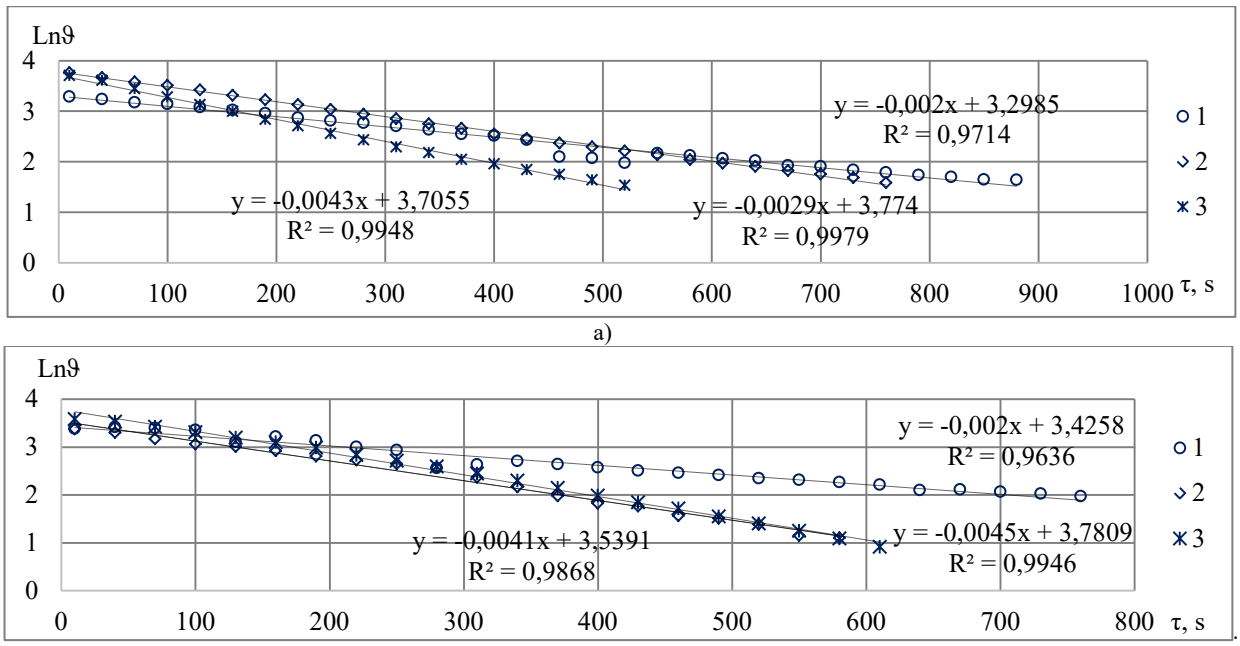

Fig. 1. The rate of cooling (heating) during heating (a) and cooling (b) of chicken litter at the following revolutions of the stirrer: 1 – 33 revolutions/minute; 2 – 114 revolutions/minute; 3 – 156 revolutions/minute.

After analyzing the distribution of excess temperature over time $Ln\vartheta=f(\tau)$ during the study of the heat exchange of chicken litter under the conditions of its cooling and heating (Fig.1), the linear rate of cooling (heating) m=const was determined, which is characteristic of a regular thermal regime during cooling (heating) of a solid body and maintaining the stability of the ambient temperature [3].

Conclusions

1. It was established that in the studied system "water in an annular volume - a thin cylindrical metal wall - the studied liquid medium" a regular thermal regime is realized.
2. Chicken droppings represent a multiphase environment, as it consists of solid particles based on a liquid medium.

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