MATHEMATICAL MODEL OF REGENERATIVE HEAT RECOVERY UNITS VENTILATION EXHAUSTS FOR LIVESTOCK

Y. Gerasymchuk, Ph.D.

National Scientific Center "Institute of Mechanization and Electrification of Agriculture" NAAS Ukraine

As a result of the transfer to industrial methods of production of livestock and poultry there have been a number of important issues to be addressed. One of them is related to the maintenance of production facilities in this air, which ensures efficient use of animal and poultry feed nutrients to maximize their productivity. But in the cold and transitional seasons maintaining livestock and poultry premises microclimate, guaranteeing maximum and cost-effective implementation of the genetic potential productivity of livestock and poultry requires significant energy costs. Reducing these costs to provide 80% reduction in heat utilizers ventilation ventilation of livestock and poultry premises. For these areas it is advisable to use regenerative heat recovery units type of counter movement of air currents, which flow heat exchange between supply air and ventilation exhausts through heat exchange surface that prevents getting into the supply air stream of water vapor and microbial and bacterial contamination of flow ventilation exhausts. However, in the cold season when the outside air temperature is less than zero degrees possible icing heat transfer surface and disability heat recovery units. To assess the energy efficiency of the use of recuperative heat utilization and appropriateness of the use of anti-icing heat transfer surface required analytical capabilities that reflect the relationship between the parameters of air flow at the inputs and outputs of the inlet and exhaust heat utilizers channels and performance purposes. So, to create a mathematical model of heat exchange between the supply air flow and ventilation exhausts livestock and poultry premises in recuperative heat recovery units is an important and urgent task.

The purpose of research - to establish the relationship between temperature and relative humidity of air flow at the inputs and outputs of the inlet and exhaust

channels and recuperative heat utilization rates purpose of ventilation exhausts livestock and poultry premises.

Materials and methods research. In recuperative heat recovery units transfer of energy from the airflow ventilation exhausts to supply air flow can be made as explicit in the heat, and in the process of mass transfer.

Characteristic of recuperative heat recovery units ventilation exhausts livestock buildings is the condensation of water vapor on the heat exchange surface side exhaust channels. A mathematical model of heat "dry" mode of heat recovery units ignores the real operating conditions in livestock buildings. Therefore, during the settlement process heat of condensation of water vapor on the heat exchange surface this time using graphic-analytical method or finite element method and hd diagram of moist air, which inhibits the use of modern computer technology.

Results. In livestock and poultry premises to exhaust channels recuperative heat recovery units supplied air relative humidity which is in accordance with industry standards for technological design is within 40-85%. This exhaust channels air into heat utilizers, giving heat flow supply air cooled and condenses on heat transfer surfaces steam. Getting water vapor condensation usually occurs not at the entrance of heat utilizers channels miscarriages, and at some distance from the entrance. Moreover, one of the heat transfer surface, which is adjacent to the entrance of junk channels teploutytlizatora the process of heat exchange between flows clear and fresh air miscarriages, and on the other side - the process of condensation of water vapor. So recuperative heat recovery units with a counter movement of air currents in terms of livestock and poultry premises can be represented in the form of two series-connected, one of which is a "dry" mode, and the second - from the condensation of water vapor on the heat exchange surface.

Methodical approach regenerative heat utilizers distribution coefficient of thermal efficiency based on the use of temperature condensation of water vapor. This temperature is maintained at the outlet exhaust heat utilizers channels and inlet channels exhaust heat utilizers. This provides a "dry" mode of heat utilizers, and heat utilizers - the condensation of water vapor on the heat exchange surface.

Heat flow condensation of water vapor increases the temperature of the air in the exhaust heat utilizers channels by switching the implied heat of water vapor in the clear. This increases the temperature difference between air currents and tidal channels exhaust heat utilizers and thus the flow of air in the inlet channel receives heat utilizers of heat flow condensation of water vapor.

Thus, methodical approach to the allocation of regenerative heat utilizers two connected in series to obtain secured relationships between the parameters of air flow and heat utilizers destination parameters in the form of analytical dependences.

As a result, the synthesis of analytical dependences established relationship between the parameters of air flow at the inputs and outputs of the regenerative heat utilizers and its performance purposes.

In addition, the regenerative heat recovery units in accordance with the law of conservation of energy amount of heat energy, which loses heat as a result of miscarriage flow of air equal to the amount of heat energy received by the flow of fresh air.

Adequacy Mathematical models based on regenerative heat utilizers correct use patterns theory of heat conduction and energy conservation law.

Conclusions

Methodical approach to distribution regenerative heat utilizers ventilation exhausts livestock buildings on two connected in series with the analysis and synthesis of relationships between the parameters of air flow rates and ensure the creation of his appointment mathematical model. Its characteristic feature is the ability to consider the relative humidity at the inlet and exhaust openings of channels recuperative heat utilizers and evaluation of the effect of relative humidity on the temperature of air flow exits inlet and exhaust channels.