UDC 636.4: 697.12

DETERMINATION OF TERMS OF ENERGY SAVING DESIGN

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Determination of microclimate parameters keeping pigs and their impact on the body's, condition and on the processes of animals heating out. The possibilities thermoregulation pig farms due to the heat and biological activity in animals. Determination of design conditions and means of realization energy efficient heating and cooling on the pig farms.

Keywords: climate, design, pig, pig farm, thermoregulation, heat output.

Introduction. By experience of successful and highly profitable pig farms it is visible that the best results can be obtain only if the intelligent design and construction, using innovative technologies and modern equipment. According to the "Development Program to 2015 pig", one of the main way of development is to the industry is transfer production pork saving innovative technologies that can provide competitive in global terms, production costs [1].

Problem. Much of the cost of production of pig production affect the costs of maintaining optimal microclimate parameters. Nowadays it is becoming increasingly important due to rising prices and reducing energy limits. All this makes the search for ways to improve existing and development of new technologies and their implementation.

Analysis of recent research and publications. One of the main factors affecting the growth and development of pigs are conditions of detention.

Failure animals in optimal conditions reduces its resistance to harmful microorganisms, increased aggression animals, reduced growth and increased feed intake. According to the requirements of pigs relative humidity in the room should be within 40 ... 75% and air velocity in the cold and transitional seasons - 0.15 ... 0.3 m / s and 0.4 ... 1 m / s - a warm . Temperature regimes must meet sex-age groups of animals: Blank farrowing and uterine grunts - 13 ... 19 ° C (optimum 16 ° C); hlybokoporosni and lactation uterus - 18 ... 22 ° C (optimum 18 ° C); pigs for fattening - 16 ... 22 ° C (optimum 18 ° C) [3,4,5]. Impact of animal heat into the environment occurs in three ways: convection, radiation and evaporation. Lowering the temperature leads to an increase of heat transfer by convection and radiation (heat explicit) and can lead to chill. At high temperatures almost all the heat that is released, given the environment of sweat evaporation (latent heat). Together with then the body loses water, vitamins, mineral salts, so that it is dehydrated and disturbed metabolism. Humidity significantly affects the impact of heat by evaporation. Because of the high moisture evaporation and the impact a loss of heat is reduced. Reducing the moisture improves heat evaporation. However, too low humidity causes drying of the mucous membranes of the

respiratory tract. Water and salt, allocated from the body, then must be replaced because their loss leads to blood clotting and violations of the cardiovascular system. Air mobility determines the level of heat loss from the skin surface by convection and evaporation. In tropical areas at a low temperature it will drive traffic impact of heat animals. As the temperature moving air it eventually place its heat to the body of the animal, heating it [2, 3]. Subject to maintain the premises optimal microclimate parameters animals be allocated a certain number of explicit and latent heat, carbon dioxide and water vapor (Table 1).Table 1.

Number of heat, carbon dioxide and water vapor released pigs per hour under optimal microclimate parameters [3].

The types and groups of animals	The weight of animal, kg	Quantity of output				
		Explicitheat kJ / h	Hiddenheat kJ / h	Completed heat kJ / h	Carbondioxide, l / h	Watervapor g / h
Boars	100-300	869-1566	339-599	1235-2165	44-77	123-216
Sows blank and farrowing	100-200	737-1168	281-440	1017-1608	36-57	101-160
Sows with offspring	100-200	1775-2349	670-867	2445-3215	87-114	242-320
Youngs	15-100	331-846	130-356	461-1202	17-43	46-119
Growing pigs	100-300	967-1696	360-620	1327-2315	47-83	132-230

The purpose of research. Explore thermoregulation piggery conditions through the use of heat animals and identify possible means of implementing energy efficient maintenance of microclimate.

Results. To find alternative ways of energy-efficient and maintenance of microclimate livestock buildings need to investigate the heat balance equation:

$$\sum Q_i^{en} - \sum Q_j^{ex} = 0, \quad (1)$$

where $\sum Q_i^{en}$ - Total heat input into the room, kJ / h; $\sum Q_i^{ex}$ - Total room heat loss, kJ / h.

More pigsty heat balance can be written as follows:

$$Q_{TV} + Q \pm Q_{Vent\ about} \pm Q \pm Q_{ogpr} - Q_{Oh} - Q_{grad} - Q_{HBS} = 0, \quad (2)$$

where Qtv - heat that comes through the heat of animals kJ / h; Qob - heat that comes through artificial heating premises kJ / h; Qvent - heat for heating or

cooling supply air ventilation depending on the outside temperature, kJ / h; Qoh - heat from the heat transfer through the construction fencing depending on the outside temperature, kJ / h; Qpr - receipt or heat loss by balancing temperature outside of displaced objects and objects in the room, kJ / h; Qoh - heat losses in the cooling room, kJ / h; Qvyp - heat loss by evaporation, kJ / h; Qobd - heat losses in the blowing room, kJ / h.

Year round Permanent positive element in this balance is the heat coming through the heat animals, as always negative - loss of heat on evaporation. Other components are seasonal and proportional to the temperature and state of the environment and seasons, as well as the condition and characteristics of the room. Direct heat coming through artificial heating and cooling buildings, is the costliest component that affects the cost of the original product. Hence there is a need to investigate all the components of the heat balance without artificial heating and cooling, and find ways thermoregulation areas through regular components.

For example calculate a separate room to hold 250 to 200 kg pigs for fattening under optimal conditions and microclimate completely insulated room with optimal characteristics incoming ventilation air. The constant heat of animals will be:

$$Q_{TV\ tv} = q \cdot n = 1758 \cdot 250 = 439{,}500 \text{ kJ / h}, \quad (3)$$

where qtv - complete pig heat, kJ / h; n - the number of pigs indoors heads.

Constant heat loss by evaporation in the room will be:

$$Q_{vol} = m \cdot n \cdot q_{te} = 175 \cdot 250 \cdot 2.49 = 108{,}937.5 \text{ kJ / h} \quad (4)$$

where m - allocation of water vapor pig, g / h; q - consumption of heat by evaporation of water 1 g, kJ / g.

That is, in this case, ignoring other components of the equation (2), it can be argued that the heat balance is positive with a certain reserve:439500 - 108,937.5

$$439500 – 108937{,}5 = 330562{,}5 \text{ kJ / h}$$

So with the full insulation space and energy efficient technologies maintain optimum parameters supply air ventilation can completely do without artificial heating or cooling energy intensive. To achieve this you need to properly design a room together with systems maintenance microclimate. The room preferably close to the square plan to the expense of the overall external perimeter wall was lower, respectively, and less heat loss from the middle of the room. First of all, the building must be carefully insulated and equipped vestibule, then the heat loss will be minimal. Modern technologies and materials allow the insulation to bring the heat to a minimum. The heat released animals can be returned to the premises or sent to other service or production facilities by means of heat exchangers and ventilation through teploakumulyatory. They allow you to use about 70% of biological warm animals. The use of heat exchangers providing technical possibility pigs begin to heat the room yourself. Heat feeding sector in this case is not required at all, and the heat from it can be used for heating and loudspeaker sector rearing pigs, fueling it if necessary using zonal heating. Through it you can not heat all areas, but only its separate areas where the animals spend the most time. Obihrivayuchy comfort zone (recreation area) animal room temperature

(section) can be kept a few degrees lower than usual normative, which will give an opportunity to significantly reduce the cost of heating buildings. In the hot season to cool the room by using water spray to facilitate the predominance of heat loss by evaporation of heat transfer animals and hot forced air. In case of low ambient temperature dopidihrivaty will need only supply air at zonal heating, which will help minimize energy consumption.

Conclusions. With proper design of facilities and equipment selection for maintaining microclimate parameters can be fully or partially provide thermoregulation by animal heat and evaporation losses, or even removal of heat and use them for other economic purposes. To reduce enerhozatratnosti heating processes in industrial pig in designing appropriate to carry out these measures, as far as possible to condense the number of pigs on the premises, which will increase yield and heat per square meter working area; improve insulation buildings, using materials with low thermal conductivity; maintain optimal microclimate parameters using fully ventilation for indoor constant heat without harm to animals and to avoid additional costs for feed; use heat exchangers, teploakumulyatory and zoned heating.

However, the task must adhere to strict control and strict management modes equipment and technological machines.

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ОПРЕДЕЛЕНИЕ УСЛОВИЙ ПРОЕКТИРОВАНИЯ ЕНЕРГОСБЕРЕГАЮЩИХ СВИНОКОМПЛЕКСОВ

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Ключевые слова: микроклимат, проектирование, свиноводство, свинокомплекс, теплорегуляция, теплоотдача.

Резюме

Определены параметри микроклимата содержания свиней и их влияние на состояние организма и процессы теплоотдачи животных.

Исследованы возможности тепморегуляции свинокомплексов за счет тепла и биологической деятельности животных. Определены условия проектирования и средств реализации энергоэффективного отопления и охлаждения свинокомплексов.

DEFINITION OF CONDITIONS DESIGNING ENERGY SAVING PIG FARMS

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Summary

Determination of microclimate in pig farms and him impact on the body and processes of heat out animals. Research opportunities thermoregulation pig by the heat and biological activity of animals. Determining the conditions and means of designing energy efficient heating and cooling pig farms.