ENERGY SAVING VENTILATION SYSTEMS FOR SHEEP PREMISES

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Abstract: The description of the experimental energy-efficient ventilation system sheepfold for lambing.

Keywords: energy saving ventilation system, low-potential heat of the soil, underground duct, heat exchanger.

Introduction

Sheep farming is one of the priority areas in providing food in Kazakhstan. The industry development, increasing number of sheep, reducing labor and production costs depend on the level of energy supply of industrial processes. Room ventilation sheepfold, creating a good climate is considerably energy-intensive process. In this process heater or radiator calorifer installation and electric heating systems for local heating of lambs which have installed power are traditionally used.

One of the effective ways of reducing energy consumption for heating and ventilation of the sheepfold would be the use low-grade heat soil through underground ducts - heat exchangers. There are several examples of the use of soil heat for heating and cooling of livestock buildings through underground ducts and heat exchangers. They allow to save 50 to 75 % of costs for heating and cooling of buildings. [1,2,3,4]. Studying these examples allowed to develop energy-saving ventilation system for sheep space [5].

Results

Figure 1 shows a functional block diagram of a ventilation device; Figure 2 describes section along A-A of Figure 1, Figure 3 shows Block diagram of motor control and regulating valves air intakes and exhaust shafts, spray and closers.
Ventilation device (Fig. 1) contains the intake shaft 1 and 2 provided with a fan motor 3 and water spray 4, exhaust shaft 5 with control valve 6 and air supply ducts 7,8 with control valves 9, outlets in air 10-ventilated room with a 11 - coil temperature of 12 linked via the intake 13 air shutter shaft 1 and placed in the soil below the freezing and the latter program controller 14 microclimate temperature sensors 16, 17, 19, 20 and 15 velocity, humidity 18 connected to the fan motor 3 control valve 6 2 9 exhaust shafts and air intakes to 7, 8 and 4, and the atomizer coil units 12 temperature.

The device contains two air-supply ducts 7, 8 to ensure continuity of supply of heated air into the room 11 during charging one of them.

Assembly and manufacture of air handling unit is made from prefabricated modular elements, designed to suit the required volume of ventilation air and the type of agricultural premises.

In a cold season the heavy gravity fresh air enters the intake shaft 1 and through air shutter 13 enters the outdoor air duct 7 contacts with the surface of the walls, is heated with the warmth of a soil and moves up, goes through 10 outlets in room 11, flowing temperature closer 12.

Air shutter 13 threshold, which is located below the bottom of the duct 7, 8 does not allow exit easily of the heated air from the air in the intake shaft 1. Thereby it provides a strictly unilateral movement gravity flow of fresh air.

The conclusion from the ventilated room of the fulfilled air is carried out through exhaust mine 5 with the adjusting valve 6 which the program regulator 14 of a microclimate operates.

Program controller 14 controls operation of the electric motor 3 of the fan 2 which supports the set speed of a self-flowing stream and adjusting valves 9, stitched air ducts 7, 8, providing the set threshold of temperature of a self-flowing stream, and also temperature closer.

As the temperature of the walls of the duct 7 or soil mass reduces the intensity of heat removal and at a certain temperature the threshold exceeds a specified value. At this point, the temperature sensor signal ground 17 climate control 14 closes the control valve air supply duct 7 and opens the valve 8. An array of ground round duct 7 after a while restores its natural temperature, i.e. recharges, and the array of soil around the duct 8 is cooled, i.e. discharges. Upon reaching the ground temperature values are normalized by the sensor 17, the controller 14 closes the valve 9 microclimate supply duct 8 and 9 opens the valve duct 7. Thus, blowing ducts alternately operate in the mode of charging and discharging, provides normalized stable supply air temperature, i.e. stabilizing the temperature of the supply air.

Enter the room heated inlet air temperature 12 wraps closer, increases its temperature to the rated value. Enable or disable the controller 14 performs closers microclimate by temperature sensor 19. 12 closers provide radiant and convective heat transfer in the process of creating a local microclimate.

6 exhaust valve shaft 5 regulates the exhaust air, its work is controlled by the sensor 14 through 20 microclimate temperature.

As the internal temperature rises gravity flow velocity decreases and at a certain temperature, the flow rate will be insufficient to provide the rated air. At this point, the signal sensor 16, the outdoor temperature sensor 15 and a flow rate regulator 14 connects the electric motor 3 microclimate fan 2.

In a warm season, heated fresh air fan 2 is injected at the intake shaft 1 in the duct 7, from 10 taps on the air enters the ventilated room. When passing through the air duct 7 the heated fresh air is cooled by transferring of heat ground via its wall. Ducts 7, 8 will also run in both the charging and discharging during a cold season.

Depending on the desired humidity parameters ventilated fresh air is moistened with water through the gun 4. Sprayer 4 is operated via the controller 14 through the microclimate humidity sensor 18 outside air and provides the required supply air humidity.

According to this scheme, designed and built experimental energy-saving ventilation system for the sheepfold and planned production testing during the lambing.

**Conclusion**

Functional block diagram of energy saving ventilation system is developed. Experimental energy-saving ventilation system for the sheepfold is built.

**literature**

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5 Innovative patent number 26930 ( RK) The ventilation device ( Patente : RGPPHV " KazNAU " MES ) Authors: MJ Issakhanov etc.