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ЖОҒАРҒЫ БІЛІМ БЕРУ САЛАСЫНДАҒЫ ИННОВАЦИЯЛЫҚ БІЛІМ ТЕХНОЛОГИЯЛАРЫ

Андатпа

Мақалада оқытудың кредиттік технологиясы қолданылатын аграрлық университеттерде физика пәнін оқытудың мәселері мен ерекшеліктері қарастырылады.

Кілт сөздер: бәсекеге қабілетті маман, маманның кәсіби құзыреттілігі, инновациялық дидактикалық жүйе, әмбебап ұйымдастырушы оқулық, практикалық бағыттағы оқулықтар жиынтығы, икемді оқу-әдістемелік кешендер.

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ИННОВАЦИОННЫЕ ОБРАЗОВАТЕЛЬНЫЕ ТЕХНОЛОГИИ В ВЫСШЕМ ОБРАЗОВАНИИ

Аннотация

В статье рассматриваются проблемы и особенности преподавания физики в сельскохозяйственных университетах при кредитной технологии обучения.

Ключевые слова: конкурентоспособный специалист, профессиональная компетентность специалиста, инновационная дидактическая система, учебник-универсальный организатор, набор практико-ориентированных учебников, гибкие учебно-методические комплексы

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INNOVATIVE VENTILATION SYSTEMS OF SHEEPFOLDS FOR LAMB

Abstract

The article discusses the results of experimental studies of an energy-efficient innovative sheepfold ventilation system, using an information-measuring system for remote recording of thermo-technical parameters of ventilation systems. The results of tests of an experimental energy-efficient ventilation system in winter and summer periods are presented. A description is given of an experimental energy-saving ventilation system for lambing sheepfold.

Key words: ventilation, low potential heat of soil, underground channel, underground heat exchanger, sheepfold.

Introduction

Rational using of fuel and energy resources is one of the global problems. One promising solution to this problem is the use of new energy-saving technologies, using renewable energy sources. The range of renewable energy on farms is quite broad: it is heating or cooling buildings, and drying of agricultural products, and desalination and water heating, and even autonomous power supply.

The advantages of the energy sources are environmental friendliness and low cost of labor and funds for the operation of facilities for their use. The solution of the problem in the energy-saving ventilation systems of agricultural buildings is the effective use of low-grade soil heat. The ground surface layers of the Earth, actually is a heat accumulator of unlimited capacity, which thermal regime is formed by the action of solar radiation. Low-grade heat of the Earth can be used in agricultural buildings for heating, hot water, air-conditioning (air-cooling). There are a number of examples of the use of soil heat for heating and cooling of livestock buildings through underground air conduits and heat exchangers. They are allowed to save from 50 to 75% of the costs for heating and cooling the buildings [1-2]. Studying these examples allowed to develop energy-saving ventilation system for sheep premises [3, 5].

Object of study

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. Exit from the ventilated room of the exhaust air through the exhaust shaft 5 with a control valve 6, which is controlled by software regulator microclimate 14.

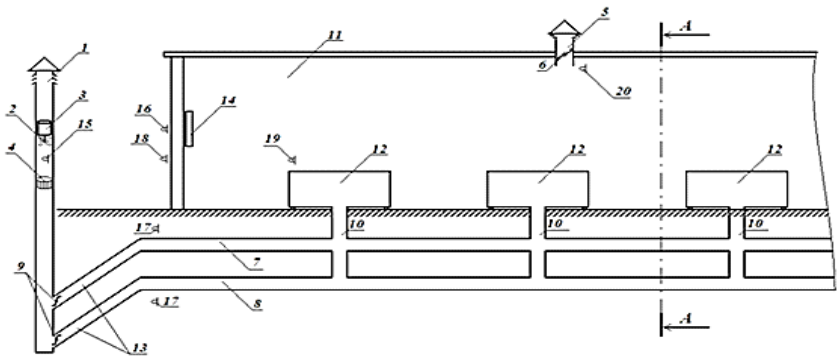

Figure 1. Diagram of the ventilation system.

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.

Under this scheme, designed and built experimental energy-saving ventilation system for the sheepfold and conducted production tests during the lambing.

Method registration of thermo technical parameters of ventilation system

For registration of thermo technical parameters of ventilation system, that is temperature of the outer, inside air, soil and humidity external and internal air have been developed information-measuring system [6].

Block scheme of information-measuring system and automation study modes of modular energy efficient ventilation system for agricultural buildings is arranged as follows: the sensors sensor OWEN DTS3015 PT1000.B2.200 designed to measure the temperature in the air conduit of ventilation system. OWEN DTS3005-PT1000.B2 designed to measure the temperature of outer air relative humidity sensor and temperature DVT-03.RS are installed on a flat surface of the wall and connected to the analog input module OWEN MV110-8A. The device operates in the RS-485 network under the protocols OWEN, ModBus-RTU, ModBus-ASCII, DCON. To transfer data to the computer modem operator is connected working in master mode, then the signals are transmitted to the processing and visualization into «skado system» MasterScada.

The experimental energy saving ventilation system was built in the sheepfold for lambing in Almaty region. Underground heat exchangers - air conduits are made of corrugated plastic pipe. Pipes are made from high density polyethylene, the nominal inner diameter from 110 *mm* to 630 *mm*. Wall's profile is "corrugation". They have a hollow structure in the form of rectangular section of hollow channels arranged perpendicularly along the axis of the pipe section; the inner layer is flat and smooth. Specially designed outer surface of pipe has high ring stiffness and makes them more resistant to compressive loads and elastic structure pipe protects them from damage when exposed to overload. As the material of high density polyethylene has: a high tensile strength, have higher thermal stability and is not subject to corrosion.

Results and discussion

The pipe is produced in the segments of standard length of 6 *m* and 12 *m* and is designed for underground lying to a depth of 15 *m*. Testing of energy saving ventilation system was carried out in two stages: winter and summer periods [6].

During tests energy saving ventilation system during the winter period found that the room temperature of the sheepfold ranged from $+5.4^0$C to $+6.0^0$C, on average + 5.6^0C , with the number of measurements n=72. The relative humidity of the room of the sheepfold was in average 79.2%. The maximum and minimum value of relative humidity was respectively 93.4%

and 64.1%. At the lowest outdoor temperature -18^{0}C (04.02.2014) supply air temperature reached 6^{0}C. Supply flow rate fluctuate depending on the outdoor temperature within 70-140 m^3/h. The maximum heat output of installation was 2.2kW.

During tests energy saving ventilation system in summer found that the room temperature of sheepfold ranged from +16.6^0C to +27.29^0C on average +22.3^0C, with the number of measurements n=820. The relative humidity of the room of sheepfold averaged 30.5%. Maximum and minimum value of relative humidity was respectively 58.88% and 10.37%. At the highest temperature of the outside air +33.4^{0}C supply air temperature reached +19.6^{0}C and humidity increased from 12% to 23%. Air flow rate was 140m^3/h. The cooling capacity of the installation was 2.6 kW.

Conclusions

In times of testing energy saving ventilation system provided the required power saving mode and zootechnical parameters of the microclimate in the maternity ward of the sheepfold. Functional block diagram of energy saving ventilation system is developed. Experimental energy-saving ventilation system for the sheepfold is built. Energy saving ventilation system has been adopted for economic use and recommended for implementation in the sheep farms in Almaty region of Kazakhstan [7]. Innovative ventilation system to improve the ecological and economic indicators of the sheep farms of our Republic [8].

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ҚОЙ ҚОЗДАЙТЫН ҚОРАЛАРҒА АРНАЛҒАН ИННОВАЦИЯЛЫҚ ЖЕЛДЕТУ ЖҮЙЕСІ

Андатпа

Мақалада желдету жүйелерінің термотехникалық параметрлерін қашықтан жазу үшін ақпараттық-өлшеуіш жүйесімен қой қорасының энергия үнемдейтін инновациялық желдеткіш жүйесінің эксперименттік зерттеулерінің нәтижелері қарастырылады. Қыста және жаз мезгілдерінде энергияны үнемдейтін желдету жүйесінің эксперименттік сынау нәтижелері келтірілген. Қой қоздайтын қора үшін эксперименттік энергияны үнемдейтін желдеткіш жүйесінің сипаттамасы берілген.

Кілт сөздер: желдету, топырақтың төменпотенциалдық жылуы, жер асты құбыры, жер асты жылуалмастырғыш, қой қорасы.

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ИННОВАЦИОННАЯ ВЕНТИЛЯЦИОННАЯ СИСТЕМА ОВЧАРЕН ДЛЯ ЯГНЕНИЯ

Аннотация

В статье обсуждаются результаты экспериментальных исследований энергоэффективной инновационной системы вентиляции овчарни, с использованием информационно-измерительной системы для дистанционной регистрации термотехнических параметров вентиляционных систем. Приведены результаты экспериментальных испытаний энергоэффективной системы вентиляции в зимний и летний периоды. Дается описание экспериментальной энергосберегающей системы вентиляции для овчарни.

Ключевые слова: вентиляция, низкопотенциальная теплота почвы, подземный канал, подземный теплообменник, овчарня.