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ENERGETIC WAY OF THE DECENTRALIZED HEAT SUPPLY OF LIVESTOCK BARNS

D. Tikhomirov

In the central and northern latitudes of Russia the most energy intensive processes in the system heating is providing livestock farms microclimate. For these purposes, it consumed more than 60 % of the thermal energy from the total cost of heat supply facility as a whole. The loss of heat is 70-80 % of the total consumption, accounted for heating the ventilation air in the cold season. Heat dissipation animals are not able to fully cover the ventilation heat loss at low outdoor temperatures.

Significant energy effect can be obtained when using heat recovery systems extract air and partial recirculation. But recycling system can not directly be used in livestock buildings because of the high bacterial contamination and Seed-circulating air and gases that result from animal waste, as well as moisture. It is therefore necessary to provide modern methods of cleaning and disinfection of air. Clean and disinfect the air is also necessary because with the ventilation air from the premises taken out large amounts of dust, microbes, gases, resulting in environmental pollution. At high dust and high content of microorganisms in the outside air ventilation becomes ineffective.

Becomes important questions not only save heat (energy), but cleaning and disinfection of air inside the room and removed from it.

Science and practice, especially in industry, is a high efficiency of heat recovery units. Heat recovery in ventilation and heating agricultural facilities can save energy up to 40-50 %. The most effective use of heat recovery units in the systems of microclimate on farms cattle and pig farms in areas where animals are kept, emit a lot of heat.

However, for a number of reasons for the wide introduction of these developments have not received, including due to the significant capital expenditures, metal and materials, cumbersome structures and a relatively low energy efficiency. In

addition, most systems are not sufficiently adapted for use in aggressive environments.

The disadvantages of heat exchanger may include a sufficiently high moisture content in the recycled air. Limiting the extent of recycling indoor air results in additional energy consumption for heating the supply air by including a built-peak electric heaters. Furthermore, when the temperature of the supply air may freeze condensate formed on the surface of the heat transfer from the exhaust air. This leads to a deterioration in heat transfer need to include defrosting performance and reducing heat exchanger.

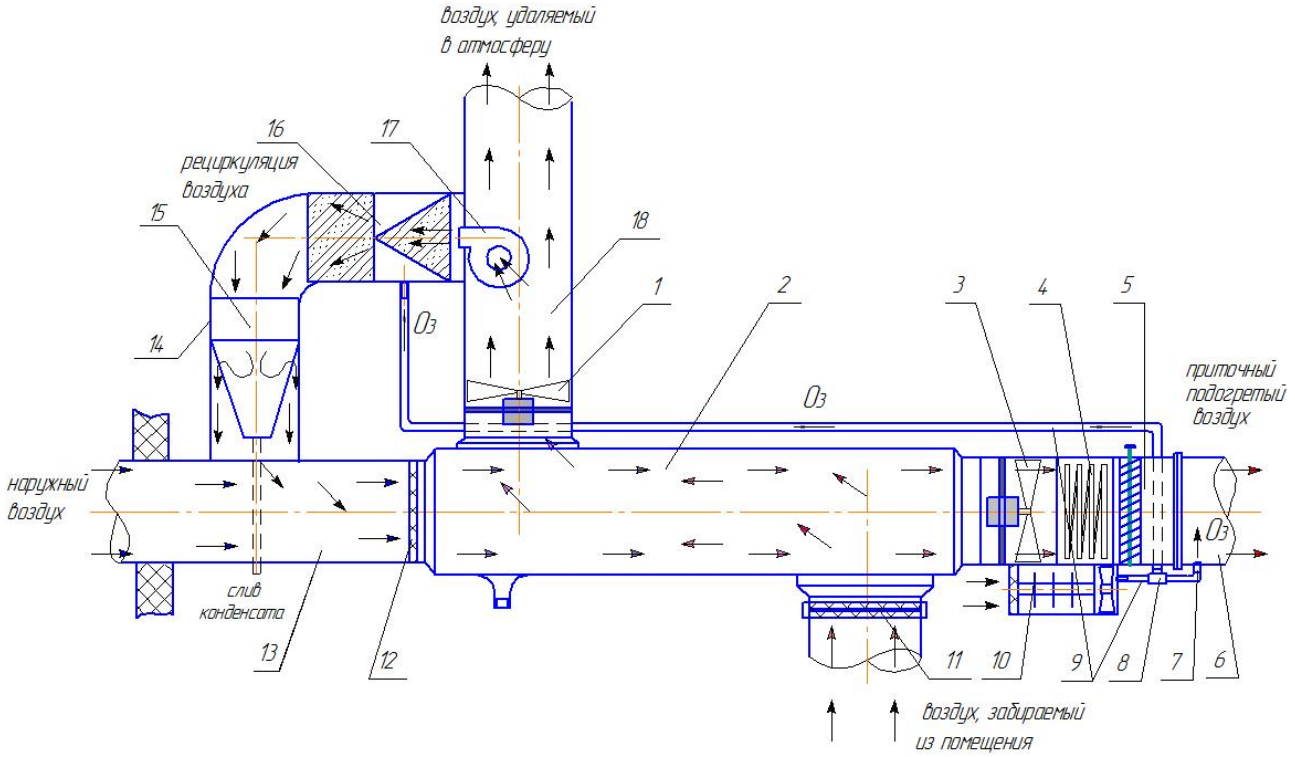
The purpose of research - development and implementation of a new way of decentralized heating livestock buildings, providing the required parameters of the microclimate (temperature, gas composition and purity of the air) in the work area of placement of animals with a significant (60 %), reducing energy consumption for heating the fresh air, improve the reliability of electrothermal equipment and improving the environment.

The results of research. On the basis of research and experience, together with AF Pershin, a new highly efficient decentralized heating and microclimate in livestock buildings, based on the principle of heat recovery, ozonation and air recirculation.

As a result of the proposed method it is possible to provide heating supply ventilation air in the coldest period of the year with a polymeric heat exchanger, as well as by increasing the amount of recirculation of warm indoor air after a deep cleaning and disinfection by ozonation, drainage, which provides energy savings of up to 60 % ; significantly improve the composition of the gas supply and exhaust air; normalize the ecological situation around livestock enterprises; improve and expand the scope of the installation.

The installation includes a fan exhaust air 1 compact heat exchanger made of polymeric materials 2, the fan supply air 3, the peak electric heater supply air 4, outlet air supply 5, the distributor of the supply air 6, connection 7, the valve 8, pipelines supplying ozone 9, ozone corona 10, the exhaust air filter 11, inlet air filter

12, the supply duct 13, a recirculation channel 14 containing a dehumidifier 15, ejector 16, agitation fan 17 with adjustable performance exhaust air duct 18 (see. figure).



Functional-technological scheme of installation

Warm, moist air from the room is drawn through the suction port of the heat exchanger 2 by the exhaust fan 1 passes through the filter 11, which is cleared from mechanical impurities and cooled and dehumidified in the heat exchange process, through the exhaust air duct 18 is removed to the outside. Outside air is sucked through the opening of the supply duct 13 via supply fan 3 passes through the filter 12 and fed to heat exchanger 2 and heated in the heat exchange process with heat is removed indoor air, via a conduit supplying air 5 is supplied to an electric heater 4, which, when necessary, is further heated to the desired temperature. After him, the fresh air is supplied to the air distributor 6. rehabilitation facilities supply air may mix with ozone, which comes from the line 9 corona discharge ozonizer 10 via the valve 8 and shtutser7.

By reducing the outdoor temperature is below the critical tn tcr 17 turns on the fan, the intake device which is located in the exhaust air duct channel 18, and a

portion of the exhaust and cooled to the dew point of the exhaust air is supplied to the room recirculation channel 14. The critical temperature tcr understood this outdoor temperature at which the onset of freezing the heat exchange-side surface extract air, the value of which depends on the design features and parameters set by the heat exchanger and the indoor air humidity. The ejector 16 create conditions for the formation of water spray (fog). Simultaneously, the ejector 16 by a conduit 9 sucked ozone from the ozonizer 10. The minute water particles have a large surface area, which contributes to the mixing of ozone and intensify the absorption of carbon dioxide and other harmful substances as well as the destruction of harmful microflora contained in the recirculated air. By oxidative effects of ozone (O3) is superior to other substances, and this suggests its use as a highly effective and inexpensive means of reorganization of air using a corona discharge ozone generators.

In the moisture separator 15, for example a cyclone type dehumidifying recirculated air occurs. Departments with the moisture containing solutions of salts and other contaminants formed after treatment with ozone air is removed in the sewers. Because the recycle channel 18 of the air to prevent freezing of the heat exchange surface from the exhaust air is directed to the input of the heat exchanger 2 to heat the incoming air. Another part of the return air channels disposed in the housing of the heat exchanger, enters the distributor 4 and an electric heater 6 of the supply air, bypassing the heat exchanger.

With this in-depth method for purifying indoor air is allowed its 75% recycling. A further increase in the degree of recycling is not desirable due to lower oxygen content in the room air as a result of animal.

Depending on the outdoor temperature changes the performance of the fan 17. In this case, by increasing the recirculation components ensure the effectiveness of the heat exchanger without freezing its surface from the exhaust air.

Through in-depth cleaning, decontamination and drainage internal air expanded its degree of recycling from 30 to 75%, which can significantly reduce energy consumption for heating outdoor fresh air, to reduce the installed power peak electric heater, to normalize the environment in and around livestock enterprises,

improve the efficiency, reliability and extend the scope of the installation at low subzero temperatures outside air.

Conclusions

Analytical and experimental research prototypes, the physical modeling of heat allowed to substantiate functional-technological scheme of energy-saving electric ventilation and heating system of modular type with heat recovery, ozone treatment and recirculation of indoor air when deep cleaning is intended to maintain the basic parameters of the microclimate during the heating period in areas where animals are kept. Further studies aimed at developing current pilot sample holding it for various tests, including the critical operating conditions.