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Creating a Comfortable Condition in Production by Improving Ventilation

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Abstract:

Industrial ventilation is one of the main elements of ensuring air exchange in buildings and industrial premises. The design and equipping of production premises with an effective ventilation system is a prerequisite for compliance with sanitary standards and rules regarding the protection of air in the working area. In addition, industrial ventilation can be one of the main components of the technological process, without which it becomes impossible.

Keywords: microclimate, ventilation, industrial ventilation, devices, temperature, air exchange.

Industrial ventilation must fulfill two main tasks: ensuring optimal air exchange in production premises and. accordingly, bringing the microclimate to the specified values. Industrial ventilation also ensures that air is brought to the required characteristics, which is an important task for some types of production. In addition, industrial ventilation is “responsible” for the prompt and effective removal of all air pollution and the removal of overheated air. That is why, depending on the type of production and technical process, the design of industrial ventilation must be approached individually in each specific case.

The microclimate of industrial premises is determined by the combinations of temperature, humidity and air speed acting on the human body, as well as the temperature of surrounding surfaces. For this reason, these characteristics are accepted as standardized microclimate parameters.

Hygienic regulation of the production microclimate is provided for by the system of occupational safety standards (OSHS) and extends to the work area, which is understood as a space up to 2 m high above the floor or platform where the permanent or temporary residence of workers is located.

A person’s health and performance directly depend on the atmosphere in which he is located, on the microclimate conditions of the room where he spends his time. A person consumes 3 kg of food and

15 kg of air per day.

Freshness and cleanliness, temperature and humidity of the air in the room are ensured by air conditioning and ventilation systems. Therefore, these engineering systems are becoming more and more widespread. They increasingly determine the comfort of our lives.

Classification of ventilation systems

The purpose of ventilation is to ensure clean air and specified meteorological conditions in production premises. Ventilation is achieved by removing polluted or heated air from a room and introducing fresh air into it.

According to the method of air movement, ventilation can be with natural impulse (natural) and mechanical (mechanical). A combination of natural and mechanical ventilation (mixed ventilation) is also possible.

Ventilation can be supply, exhaust or supply and exhaust, depending on what the ventilation system is used for, for supplying (supplying) or removing air from the room or/and for both at the same time.

Depending on the location of action, ventilation can be general and local.

The action of general ventilation is based on diluting polluted, heated, humid indoor air with fresh air to the maximum permissible standards. This ventilation system is most often used in cases where harmful substances, heat, and moisture are released evenly throughout the room. With such ventilation, the required air parameters are maintained throughout the entire volume of the room.

Air exchange in a room can be significantly reduced if harmful substances are captured at the points of their release. For this purpose, technological equipment, which is a source of release of harmful substances, is equipped with special devices from which polluted air is sucked out. This type of ventilation is called local exhaust.

Local ventilation, compared to general ventilation, requires significantly lower costs for installation and operation.

In industrial premises in which a sudden release of large quantities of harmful vapors and gases into the air of the working area is possible, emergency ventilation is provided along with the work area.

In production, combined ventilation systems are often installed (general exchange with local, general exchange with emergency, etc.).

Improving the existing supply and exhaust ventilation system in livestock buildings

A known supply and exhaust ventilation system for livestock premises /1/, including air ducts, fans, ventilation chambers, electric drives, control panels, and entrance windows.

The disadvantages of this system /1/ are the lack of regulation of humidity and temperature of the supply and internal air, control of temperature, humidity and concentration of harmful substances at various points in the room. lack of heating devices and room air humidification.

Another known supply and exhaust ventilation system for livestock premises includes air ducts, fans, ventilation chambers, electric drives, a control panel, and entrance windows.

The disadvantages of this system are the lack of control and regulation of the humidity of the supply and internal air, temperature and concentration of harmful substances - internal air at various points in the room. These shortcomings do not allow providing the necessary microclimate in the room.

The technical result of the proposed supply and exhaust ventilation system is to ensure optimal microclimate parameters in the livestock building. The specified technical result is achieved by: that changes are being made to the design of the air ducts and ventilation chamber. Sensors for

monitoring humidity, temperature and concentration of harmful substances in the internal air, connected to the electric drive of the fans, are mounted on the intake sleeves of the exhaust ventilation air ducts. A supply air humidity control sensor connected to the sprinkler and a supply air temperature sensor connected to the water heater are mounted inside the supply air ventilation chamber, and the sprinkler is made in the form of a section of tubular blocks. on which finely dispersed water sprays are mounted.

A comparison with systems 1 and 2 shows that the proposed system differs in that sensors for monitoring humidity, temperature and concentration of harmful substances in the internal air, connected to the electric drive of the fans, are mounted on the intake sleeves of the exhaust ventilation air ducts. This design solution allows you to regulate the humidity and temperature of the internal air, and also allows you to control the temperature, humidity and concentration of harmful substances at various points in the room. In the proposed system, a supply air humidity control sensor connected to a sprinkler and a supply air temperature sensor connected to a water heater are mounted inside the supply air ventilation chamber. The sprinkler is made in the form of a section of tubular blocks on which finely dispersed water sprays are mounted. This design solution allows you to regulate the humidity and temperature of the supply air.

Figure 4 - General view of supply and exhaust ventilation

The proposed device is illustrated by drawings, where in Fig. Figure 4 shows a general view of the supply and exhaust ventilation.

The supply and exhaust ventilation device consists of supply ventilation 1 and exhaust ventilation 2. Supply ventilation 1 consists of air ducts with distribution nozzles 3 and a ventilation chamber 4, on which there is an entrance window with blinds 5 and an electric fan 6. A sensor is mounted inside the ventilation chamber 4 temperature 7. electrically connected to the water heater 8 through the electric valve 9, humidity sensor 10. electrically connected to the sprinkler 11 through the electric valve 12. The sprinkler 11 is made in the form of tubular blocks 13, on which finely dispersed sprayers 14 are mounted, under which a tray 15 is installed to collect excess water.

Exhaust ventilation 2 consists of air ducts 16 with intake hoses 17, on which humidity sensors 18, temperature sensors 19 and sensors for recording the concentration of harmful substances (dust and gases) 20 are mounted on the outside. Air ducts 16 are connected to an exhaust pipe 21, inside of

which there is a roof fan with electric drive 22 connected to the control panel 23 for exhaust 1 and supply 2 ventilation.

The device works as follows. The temperature sensor 7 of the supply ventilation 1 is triggered in the case of a low supply air temperature and the electric valve 9 is activated to turn on the water heater 8 and heat the air to the required temperature. Humidity sensor 10 of the supply ventilation 1 case of high humidity in the supply air and the electric ventilation is triggered to turn off the sprinkler 11. In the stall where the parameters of humidity, temperature and concentration of harmful substances are exceeded, the corresponding sensors 18-20 are triggered, which turn on the roof fan with electric drive 22, after which the air goes outside through intake hoses 17, air ducts 6 and exhaust pipe 21 until the required parameters of humidity, temperature and concentration of harmful substances are established.

The present invention relates to the field of agriculture, in particular to ventilation systems for livestock buildings.

Improvement of supply and exhaust ventilation is achieved by installing sensors for monitoring humidity, temperature and concentration of harmful substances in the internal air, connected to the electric drive of the fans, on the intake sleeves of the exhaust ventilation air ducts. A supply air humidity control sensor connected to the sprinkler and a supply air temperature sensor connected to the water heater are mounted inside the supply ventilation chamber, and the sprinkler is made in the form of a section of tubular blocks on which fine water sprays are mounted.

The technical result of the invention is to reduce the concentration of harmful substances and ensure optimal microclimate parameters in the livestock building.

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