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Waste Energy of Industrial Facilities for Residential Heating Supply

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Abstract: The question of the use of waste energy in the form of heat of industrial facilities for residential heating supply was discussed. Design of the device with a heat pump to provide year-round supply of a farm with a hot water and heating ventilation air using heat of the exhaust air was presented.

Key words: Heat · Secondary energy sources · Evaporator · Heat exchanger · Heat carrier

INTRODUCTION

Due to the ever increasing in all sectors of the economy needs the fuel of great importance is the use of secondary energy resources.

Substances with a specific energy potential (calorific value) and which are by-products of human activities, are called secondary energy sources.

Secondary energy sources include combustible waste organic matter, urban and industrial waste, hot waste coolant and waste from agricultural production.

To maintain optimal air quality when storing food products in most cases use a refrigeration machine. As you know, the refrigerating machine can be used not only for cooling purposes, but also to receive warmth in the elements of the power installation according to the scheme of the heat pump. The translation of the refrigeration unit in a mode "the heat pump" the electric power consumption often increases slightly in connection with capital expenditures for maintenance of the heating system are quite acceptable. For the case when the demand for cold and heat exist at the same time, the design of the refrigerating unit introduce additional switch allowing to choose the desired mode of operation of the power plant.

For rational use of energy requires that the consumer of heat was in the vicinity and had a low temperature heating system. An example of premises with low-temperature heating system is a large fruit storage in the refrigerator. Because the fruit remain in storage until the next harvest next year, then this heat source is enough for the entire heating season.

If sources of heat are small fruit storage, in this case, it is necessary to provide an additional source of heat.

In [1] describes the procedure for installation with a heat pump intended for heating of the trading floor together with inside the household and utility rooms. The heat pump is used the main source of heat. As heat energy for heating of the trading floor, use the heat rejection from the condensers of refrigerating machines is situated next door to the fridge - the fruit storage. Nearby and water-filled former quarry with the influx of groundwater, supplies water to cool the refrigeration units and serves as a heat source for the heat pump in the case when there is not enough heat rejection from condensers of refrigeration units. Minimum water temperature in the quarry is 5.5, which allows its use in a compact water-to-water heat pump.

There are great opportunities for use in the exhaust environment of warmth on the food industry.

For example, many Breweries, meat and dairy plants and factories for the production of sausages are large centralized refrigeration plant. Capacity installed at such plants refrigerating machines would be quite sufficient to cover the greater part of the annual consumption of heat.

Necessary microclimate in livestock buildings can be created by implementing energy-saving systems installations with a heat pump, which simultaneously conditionerit the indoor air to the required parameters and use physiological animal heat for heating and hot water supply of residential houses and industrial premises.

In [2, 3] schemes and the description of the installation with a heat pump for year-round farm providing hot water and heating of ventilation air using heat of exhaust air (Figure 1).

In the stall the animal is mounted a plastic heat exchanger 5, which transmits the heat from air to intermediate heat carrier (water) which is piped to the

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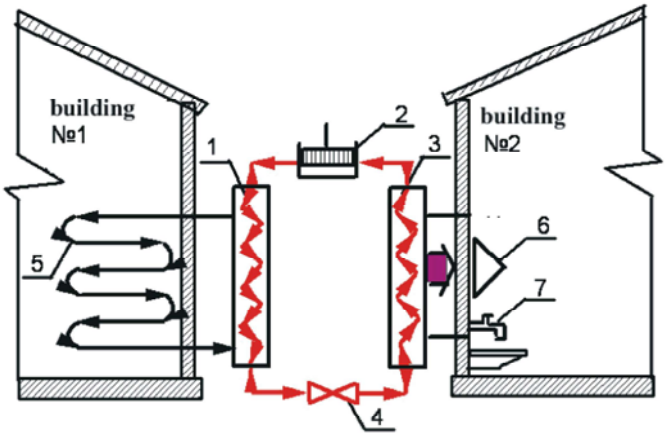

Fig. 1: Installation with a heat pump for livestock buildings [2, 3]: 1 – evaporator; 2 – compressor; 3 – condenser; 4 – throttle; 5 – primary heat exchanger; 6 – inlet grill for supplying heated air into the room; 7 – mixer tap hot water system.

evaporator 1 heat pump system. Through the tubes of the evaporator 1 is also flowing water, which is why this type of evaporator unit can be classified as "water - water". When near a stall of animals and houses the evaporator 1 can be placed directly in the stall and then the installation of the primary heat exchanger 5 in the design of the heat pump is eliminated. Next, the water passes through an orifice 4 and into the condenser 3, where it gives up its heat in a residential building in the form of hot water for the needs of DHW and ventilation and then water from the condenser 3 enters the compressor 2.

Firm Westfalic developed a series of stall installations with a heat pump with different heat capacity (the rate of 1.0 – 1.5 kW per 10 m2).

For example, heat pump system with drive 6 kW at efficiency factor equal to 4 can provide 24 kW of heat.

The criterion of economy in the use of heat pump systems is the efficiency ratio, which should range from 2.5 to 4.

Heat pump installation no additional power supply is recommended if the livestock building is designed for 300 swine, or 300 cows, or 20, 000 laying hens. With a smaller population you must connect an additional heating system. To prevent corrosion and contamination of the evaporator heat pump installation is used with an intermediate heat exchanger.

Thus, the use of installations with heat pump for heating residential buildings is currently an urgent task, since in this case there is considerable saving of fuel resources.

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