

DEVELOPMENT THE PREMISES HEATING SYSTEM OF HOSPITALITY ESTABLISHMENTS

РОЗРОБКА СИСТЕМИ ОПАЛЕННЯ ПРИМІЩЕНЬ ЗАКЛАДІВ ГОСТИННОСТІ

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Abstract. In the article were analyzed heating systems that used in hospitality establishments. A new premises heating system with improved economic indicators and a high level of energy efficiency has been proposed and developed. The research from determine the effectiveness of its application in the hotel and restaurant industry was conducted.

Key words: heating system, infrared heating panels, temperature sensors, automatic control system of the premises thermal balance, hospitality establishments.

Introduction.

Today, the task of conservation energy resources is very actual in the world. This problem applies to all spheres of human activity. Every year there are new developments and technologies, which increase the efficiency use of equipment from this point of view.

The hospitality branch, as a significant component of development state economy also requires the widespread use of innovative and energy-saving technologies. If consider the establishments of hotel and restaurant enterprises in general, then the use of energy-saving technologies in this sense will relate to their specific component. Since the heating systems in the services sector are the most energy intensive, and, as a rule, not economical, so the research was conducted precisely in this direction.

There are many buildings heating systems, which characterized as advantages and disadvantages. However, hospitality facilities require a specific heating system, which characterized by high energy efficiency and provision of special conditions.

From this perspective there is a small number of works [1-3], which definitely do not solve the specified tasks. Therefore, the purpose of work is development the premises heating system of hotel and restaurant facilities with improved economic indicators and a high level of energy efficiency.

The main text.

Conducted analytical investigation allowed to establish that in the majority of ukrainian establishments of hotel-restaurant enterprises used a classic heating system with a centralized heat supply from the city CHP. Their number is 79% of the total volume. At the same time, 18% of institutions use autonomous heating systems, which are characterized by greater efficiency and less energy consumption. And only about 3% of ukrainian hotels and restaurants are apply innovative technologies for heating the premises.

Worth to notice that reviewed heating systems completely heat all premises of establishments and do not take into account the individual visitors needs with local heating of particular zone.

For solve this purpose proposed used infrared panels as heating element, at the same time the temperature of the air will be controlled by appropriate sensors, which are located at fixed points along the perimeter of the premises. At the same time, control and management for its total thermal balance by special automatic system are carried out. It is connected with heating panels and temperature sensors and provides continuous monitoring of the room heating and if necessary, turns on or off the infrared panels through sensors.

Increase energy efficiency and improving the economic performance of the heating system provided with the use of infrared panels, temperature sensors and a special automatic system for controlling the thermal balance of a room on the basis of microprocessor technology. It allows a wide range of temperature variations and to continuously monitor and control the level of air heating.

The developed heating system consists of infrared heating panels, temperature sensors and automatic heat balance control system of the room.

The heating system works as follows.

When turn on infrared panels 2 through the network 1 the room is heated to a certain fixed temperature, which is programmed in the automatic thermal balance control system 4. At the same time, there is constant control of level air heating with temperature sensors 3. Since they are rationally located around the perimeter of the whole room, there is a qualitative control over the amount of its warming up. As soon as one of the sensors will point to increase air temperature indoors, automatic system 4 immediately disables the required number of panels 2, which provides the necessary thermal balance (Fig.1.).

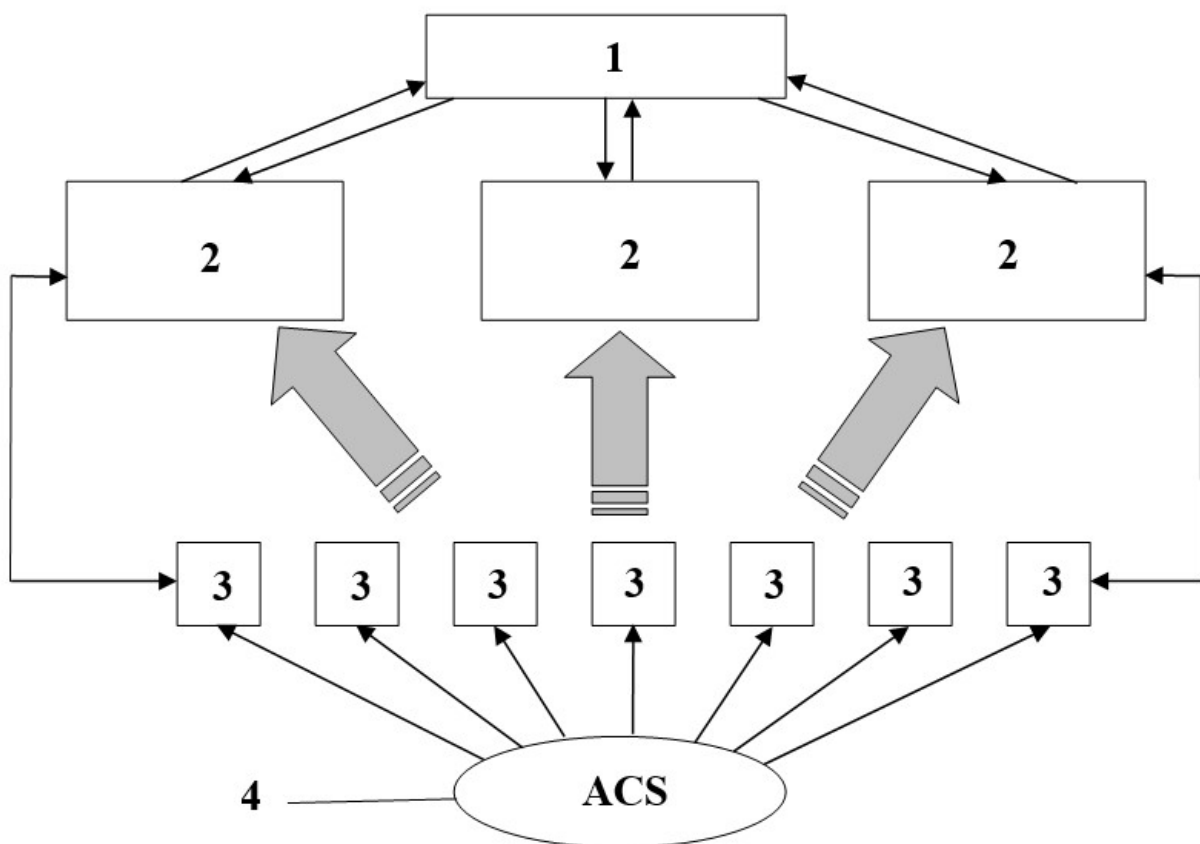


Figure.1. Structural scheme of heating premises system of hospitality establishments where: 1 - electrical network; 2 - infrared heating panels; 3 - temperature sensors; 4 - automatic control system of the premises thermal balance

By author

With decreasing air temperature in the room below a certain fixed value the cycle is repeated.

Due to the use of a wide range and number of heating panels and sensors, as well as any of their location in the premises, it is possible to control the level of air temperature in the fixed zones, which greatly increases the flexibility of the system, its economic performance and overall comfort. This is especially important for hotel and restaurant establishments and residential premises where need to constantly change and vary the amount of air heating.

To determine the effectiveness of application developed heating system was conducted appropriate research. The comparison was made with the usual heating system, and also with similar system with infrared panels, but without the developed automatic control system of the premises thermal balance. The research was conducted in a room of 62m³ using 3 infrared panels rated power of 2.7 kW. After research was built appropriate graphic dependencies (Fig.2.).

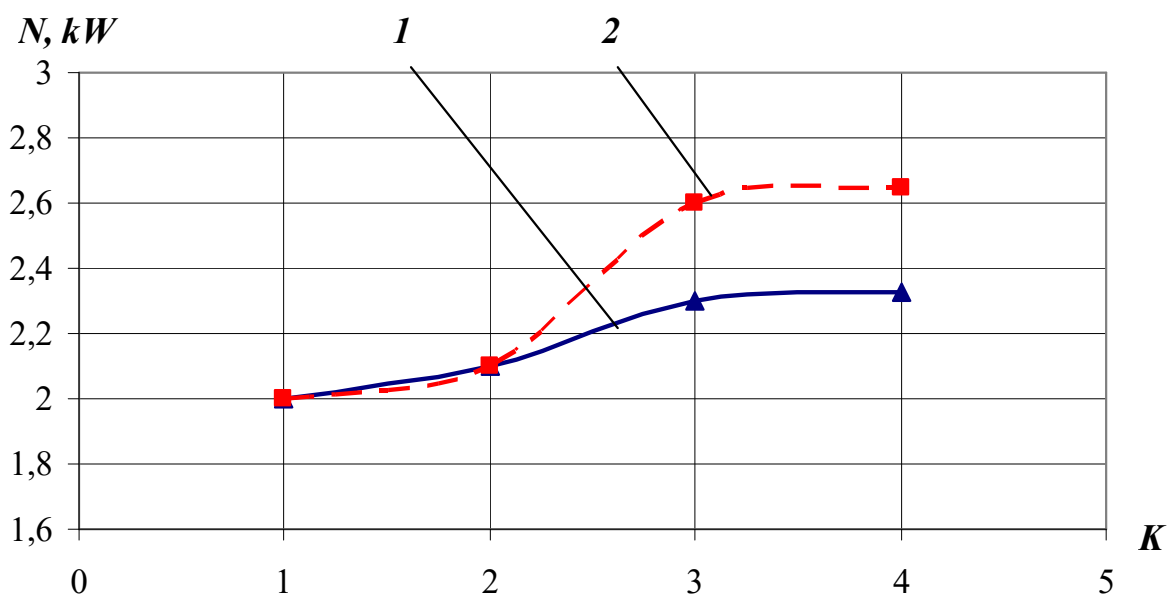


Figure.2. Graphic dependence of power changes energy consumption in the room where: N - total power, K - power consumption stages, 1 - developed heating system, 2 - conventional heating system with infrared panels

By author

Conducted investigations allowed to establish that the use of the developed heating system reduces power consumption by 2.13 times compared with conventional centralized heating systems and by 17% – with similar systems. This

significantly increases the level of comfort at expense of possibility local regulation of the room temperature and automatic adjustment of its value by a fixed algorithm of work.

The proposed heating system of hotel and restaurant establishments is characterized by the following advantages:

1. reduction of energy consumption for heating of premises in 2,13 times (17% – with similar systems);
2. high speed response of the system to change the thermal balance in the room;
3. reliable control of the level of air heating in the rooms;
4. increase energy efficiency at the expense of rational energy consumption;
5. the possibility of adjusting the temperature level in fixed areas of the room;
6. increase of the general level of comfort;
7. the ability to program any parameters and heating modes of the premises.

Summary and Conclusions.

In the article were analyzed advantages and disadvantages of heating systems that used in hospitality establishments. A new premises heating system with improved economic indicators and a high level of energy efficiency has been developed. The research from determine the effectiveness of its application in the hotel and restaurant industry was conducted and allowed to establish that the use of the developed heating system reduces power consumption by 2.13 times compared with conventional centralized heating systems and by 17% – with similar systems.

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Анотація.

В статті проаналізовано переваги та недоліки систем опалення споруд закладів готельно-ресторанного господарства, які отримали найбільше поширення. Проведені аналітичні дослідження дозволили встановити, що у більшості українських закладів гостинності використовуються неефективні системи опалення приміщень. Встановлено, що лише близько 3% українських готелів та ресторанів застосовують інноваційні технології для опалення приміщень.

Запропоновано та розроблено нову систему опалення приміщень закладів гостинності із покращеними економічними показниками та високим рівнем енергоефективності. Вказані параметри забезпечується використанням інфрачервоних панелей, датчиків температури та спеціальної розробленої автоматичної системи контролю теплового балансу приміщення на основі мікропроцесорної техніки, яка дозволяє в широкому спектрі варіювати температурними режимами та здійснювати постійний моніторинг та управління рівнем нагрівання повітря. Визначено переваги запропонованої системи опалення. Проведено дослідження з визначення ефективності її застосування в готельно-ресторанному господарстві та встановлено, що вона зменшує енергоспоживання в 2,13 рази у порівнянні із звичайними системами опалення, а також на 17% - у порівнянні із аналогічними системами.

Ключові слова: система опалення, інфрачервоні нагрівальні панелі, датчики температури, автоматична система контролю теплового балансу приміщень, заклади гостинності.

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