ЕКОЛОГО-ЕНЕРГЕТИЧНА БЕЗПЕКА МІСТ: ІННОВАЦІЙНІ ТЕОРЕТИЧНІ І ПРИКЛАДНІ АСПЕКТИ

EXPERIENCE OF THE O. M. BEKETOV NUUEK IN THE CREATION AND INTRODUCTION OF INNOVATIVE ENERGY EFFICIENT TECHNOLOGIES

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One of the priority directions for the development of modern municipal energy is to increase the energy efficiency of the sphere of heat consumption in buildings. This is due to the fact that, on the one hand, in the total energy balance of a building, the costs of its heat supply are the highest and amount to 89% [1], and on the other hand, there is a potential opportunity for a significant increase in the rationality of the use of thermal energy in buildings through the use of technology “ smart home "in the operation of heating and hot water supply systems. These technologies can be effectively applied in buildings of various construction periods - both in modern buildings that have a sufficient level of energy efficiency in accordance with the requirements of the current building codes and do not require the implementation of other energy-efficient measures, as well as in buildings of earlier construction periods, which may require implementation additional measures to improve their energy efficiency, such as: thermal modernization of the enclosing structures and internal pipelines of the building, modernization of ventilation systems, hot water supply, etc.

At the O.M. Beketov National University of Urban Economy in Kharkiv (O.M. Beketov NUUE) on the basis of one of the educational buildings introduced and experimentally investigated the system of automated control of thermal regimes of the premises of the building - HERZ Smart Comfort, which implements the technology "smart home" [2, 3]. In the course of experimental and computational studies were obtained the results of a comprehensive assessment of the environmental and economic efficiency of using this system.

As a full-scale facility for research used a fragment of the educational building of the O.M. Beketov NUUEK, which is a 3-storey building with 5 rooms with a total heated area of 225 m^2 (Fig. 1).

Implemented in the heating system of a full-scale object, the automated complex HERZ Smart Comfort with the "smart house" technology allows you to set the specified temperature regimes in the premises of the building: comfortable with a temperature t_{in}^{comf} – in rooms that need it, and economical with a temperature t_{in}^{ec} = 15 °C (3 °C lower from t_{in}^{comf}) – in other rooms.

Fig. 1. General view of a full-scale object for research

Created a methodology for a comprehensive assessment of the effectiveness application of «smart home» technology in the operation of the building heating system according to two criteria [4, 5]:

– ecological effect, which is characterized by indicators: absolute and relative reduction of heat energy consumption during the heating period, reduction of fuel consumption, reduction of emissions into the atmosphere of pollutants and greenhouse gases, in particular - NO_x and CO_2;

– economic effect, which is characterized by indicators: reduction of financial costs for consumed fuel and heat energy, profitability and payback period of energy-saving measures.

Investigated ecological and economic efficiency of using in the heating system of a 3-storey building of the educational building of O.M. Beketov NUUE with a total heated area of 225 m^2 of an automated complex for controlling thermal modes of premises HERZ SmartComfort with “smart home” technology. It has been

established that the use of this energy-saving measure allows to obtain an annual environmental effect in the form of a reduction in heat energy consumption by 13.2%, which is 6280 kW·h, a decrease in natural gas consumption for heating by 683 m^3 and a reduction in CO_2 and NO_x emissions into the atmosphere by 1326 kg, and 1.42 kg, respectively. The economic effect in the form of a decrease in financial costs for consumed thermal energy and fuel is UAH 7371 and UAH 6049, respectively.

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ВПЛИВ ЕНЕРГЕТИЧНИХ ОБ'ЄКТІВ НА ЕКОЛОГІЧНУ БЕЗПЕКУ МІСТ

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Сьогодні етап розвитку людства характеризується збільшенням техногенного навантаження на природне середовище, саме тому актуальним залишається питання впливу енергетичних об’єктів на екологічну безпеку міст.

Енергетичні забруднення міст вже давно не зникають з переліку важливих проблем людства. Негативні та небажані наслідки його нині є глобальною загрозою для здоров’я, життя громадян, нормального функціонування життєдіяльності суспільства. Відповідно до ст. 50 Конституції України: «Кожен