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"Наукові здобутки молоді –
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харчування людства у ХХІ
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The publication contains materials of 91th International scientific conference of young scientists and students "Youth scientific achievements to the 21st century Nutrition problem solution".

It was considered the problems of improving existing and creating new energy and resource saving technologies for food production based on modern physical and chemical methods, the use of unconventional raw materials, modern technological and energy saving equipment, improve of efficiency of the enterprises, and also the students research work results for improve quality training of future professionals of the food industry.

The publication is intended for young scientists and researchers who are engaged in definite problems in the food science and industry.

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Видання містить матеріали 91-ї Міжнародної наукової конференції молодих учених, аспірантів і студентів "Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті".

Розглянуто проблеми удосконалення існуючих та створення нових енерго-та ресурсощадних технологій для виробництва харчових продуктів на основі сучасних фізико-хімічних методів, використання нетрадиційної сировини, новітнього технологічного та енергозберігаючого обладнання, підвищення ефективності діяльності підприємств, а також результати науково-дослідних робіт студентів з метою підвищення якості підготовки майбутніх фахівців харчової промисловості.

Розраховано на молодих науковців і дослідників, які займаються означеними проблемами у харчовій науці та промисловості.

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24. The Potential of Wastewater Heat Recovery in Residential Buildings

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Introduction. With the global focus on climate change, scientists are exploring efficient energy use. Urban areas and construction account for a major share of energy consumption, significantly contributing to the greenhouse effect and CO₂ emissions. Water heating makes up 20-25% of household energy use.

Material and methods. This work reviews literature on reducing energy consumption through the use of a domestic wastewater heat exchanger.

Results and discussion. Waste heat/energy recovery can decrease energy costs and environmental impact. Utilizing and reusing wastewater energy can reduce total household energy consumption and hot water preparation costs.

The primary sources of wastewater that impact wastewater heat recovery system are showers, sinks, dishwashers, and washing machines. The core concept of this method is to increase the temperature of the supply water by preheating it using the heat extracted from the drain water. By doing so, the supply water is warmed before it enters the water heater, which reduces the amount of energy required to bring the water up to the desired temperature. This preheating process takes advantage of the thermal energy that would otherwise be lost in the drainage system, thus improving the overall energy efficiency of the water heating system. By utilizing the heat from these common household sources, the system can significantly reduce energy consumption and costs associated with heating water.

In 2016, a study by the Technische Universität Berlin was conducted in student hostels in Berlin, where variations in water supply, wastewater, and room temperatures were observed during winter over a period of one month. The results indicated that the water supply temperature had an insignificant effect on the variations in in-house wastewater temperature compared to the influences of room temperature and water usage. The daily average temperature of the in-house wastewater ranged from 11°C to 20°C, with an average of approximately 15°C. It was demonstrated that by using an appropriate combination of a heat exchanger and heat pump, about 40 kWh/h of thermal energy could be recovered from the in-house wastewater, leading to savings of around 230 €/day.

Implementing such systems on a larger scale could offer substantial economic benefits and contribute to more sustainable energy practices. The findings highlight the potential for significant energy savings and reduced environmental impact through effective wastewater heat recovery strategies.

Conclusions. The study shows that effective wastewater heat recovery systems can significantly reduce energy consumption and heating costs. Up to 30% of the energy needed to heat water can be provided by recovering wastewater energy within the home, offering substantial economic and environmental benefits.

References.

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