



**O'ZBEKISTON IQLIM SHAROITIDA QUYOSH KOLLEKTORIDAN
FOYDALANIB SUV ISITISH TIZIMINING ENERGETIK SAMARADORLIGINI
OSHIRISH USULINI ISHLAB CHIQISH**

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Kalit so'zlar: *quyosh kollektori, suv isitish, energetik samaradorlik, issiqlik
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Dolzarbligi. O'zbekistonda issiqlik yakuniy energiya iste'molining deyarli uchdan ikki qismini tashkil qiladi, markazlashgan issiqlik ta'minotining 95 foizi 2019-yilda tabiiy gaz hisobiga qoplangan [1]. Mamlakatning quyosh resursi yuqori: Samarqandda global gorizonta radiatsiya yiliga 1753 kVt·soat/m², quyoshli kunlar soni taxminan 320 ta [2], Farg'ona vodiysida quyosh nurlanishining davomiyligi yiliga 2900–3100 soat [3]. Shunga qaramay quyosh kollektorlarining keng qo'llanilishiga arzon va subsidiyalanadigan qazilma yoqilg'i to'sqinlik qilmoqda [4], shu sababli tizim samaradorligini oshirish iqtisodiy jihatdan ham muhim.

Maqsad. O'zbekiston iqlimiga mos quyosh suv isitish tizimi samaradorligini oshirish usulini ishlab chiqish uchun xalqaro tajribani tahlil qilish va tadqiqot yo'nalishlarini belgilash.

Usul. Nazariy tahlil: nashr etilgan sharhlar, simulyatsiya va eksperimental ishlar solishtirildi. Tezisdan o'z tajriba natijalari keltirilmagan.

Tahlil natijalari. Birinchidan, kollektor turi iqlimga bog'liq: vakuumlangan nayli kollektor sovuq iqlimda yagona kollektor sifatida ustun, yassi kollektorning maksimal chiqish harorati esa odatda yuqoriroq [5]. Ikkinchidan, qiyalik burchagini yillik issiq suv ta'minoti bo'yicha tanlash kerak: Krakovda yillik quyosh ulushi kenglikdan taxminan 10° katta burchakda eng yuqori bo'lgan [6]. Uchinchidan, tizim darajasidagi choralar muhim: issiqlik akkumulyatoriga fazaviy o'zgaruvchan material kiritilganda sonli modelda termik samaradorlik 70 foizgacha yetgan [7]; adaptiv boshqaruv eksperimentda issiqlik saqlash samaradorligini 0,55 dan 0,63 gacha oshirgan [8], ammo ba'zi sharoitlarda oddiy ON–OFF boshqaruv yaxshiroq bo'lgan [9]. To'rtinchidan, elektr qozonni havo-suv issiqlik nasosi bilan almashtirish Xitoydagi tizimda o'rtacha quvvat sarfini 72,7 foizga kamaytirgan [10].

Mahalliy omillar. Qishki muzlashdan himoya tizimi Krakov yaqinidagi kuzatuvda kollektor issiqlik ishlab chiqarishining 7–13 foizini sarflagan [11], Toshkent sharoitidagi simulyatsiyada esa chang tufayli fotoelektrik panellar quvvatining 30 foizigacha yo'qolishi mumkin, haftalik tozalash esa ish ko'rsatkichining 93 foizdan ortig'ini saqlagan [12]. Kollektorlar uchun O'zbekistonda bunday ma'lumotlar yetarli emas.

Xulosa. Samaradorlikni oshirish bitta qurilmaga emas, kollektor turi va qiyalik burchagi, akkumulyator, boshqaruv, yordamchi manba, muzlashdan himoya va tozalashni birga tanlashga bog'liq. Keltirilgan raqamlarning ko'pi boshqa mintaqalarga yoki simulyatsiyaga



tegishli, shuning uchun taklif etilayotgan usul O'zbekiston sharoitida o'lchovlar bilan (kollektor FIK, yillik quyosh ulushi, akkumulyator samaradorligi, qaytim muddati) tekshirilishi zarur.

Adabiyotlar

1. International Energy Agency. Solar energy policy in Uzbekistan: a roadmap [Internet]. Paris: IEA; 2022. <https://www.iea.org/reports/solar-energy-policy-in-uzbekistan-a-roadmap>
2. eclareon GmbH, BSW-Solar. Enabling PV: potential of the Uzbek PV market [Internet]. Berlin: eclareon; 2022. https://www.solarwirtschaft.de/datawall/uploads/2021/10/enabling_pv_uzbekistan_eng.pdf
3. Madaminov J, Ergashev I, Rustamova M, Tohirov I, Kodirov M, Valixonov D, et al. Efficiency of using a solar air heating collector in a continental climate. E3S Web of Conferences. 2024;592:01014. doi:10.1051/e3sconf/202459201014
4. Gerden E. Rising demand for solar thermal in Uzbekistan [Internet]. Solar Thermal World; 2019. <https://solarthermalworld.org/news/rising-demand-solar-thermal-uzbekistan/>
5. Greco A, Gundabattini E, Gnanaraj DS, Masselli C. A comparative study on the performances of flat plate and evacuated tube collectors deployable in domestic solar water heating systems in different climate areas. Climate. 2020;8(6):78. doi:10.3390/cli8060078
6. Kupiec K, Król B. Optimal collector tilt angle to maximize solar fraction in residential heating systems: a numerical study for temperate climates. Sustainability. 2025;17(14):6385.
7. Zakri W, Mellouli S, Fageehi Y. Performance assessment of three latent heat storage designs for a solar hot water tank. Sustainability. 2023;15(1):640. doi:10.3390/su15010640
8. Znaczk P, Chamier-Gliszczyński N, Kaminski K. Experimental study of solar hot water heating system with adaptive control strategy. Energies. 2025;18(15):3904. doi:10.3390/en18153904
9. Znaczk P, Kaminski K, Chamier-Gliszczyński N, Szczepanski E, Gołda P. Experimental analysis of control methods in solar water heating systems. Energies. 2021;14(24):8258. doi:10.3390/en14248258
10. Huang D, Ma H, Ma S, Chen M, Xu C, Zhang Y, et al. Study on the energy efficiency improvement and operation optimization of a solar water heating system. Applied Sciences. 2022;12(14):7263. doi:10.3390/app12147263
11. Pater S. Long-term performance of anti-freeze protection system of a solar thermal system. Processes. 2020;8(10):1286. doi:10.3390/pr8101286
12. Fayzullayeva S, Djurayeva S, Bobojonova M, Malikova S, Xasanova L, Ruzieva N, et al. Optimizing cleaning frequency for photovoltaic panels: balancing dust accumulation and energy yield in arid climates. E3S Web of Conferences. 2026;692:01005. doi:10.1051/e3sconf/202669201005