EURASIAN JOURNAL OF ACADEMIC RESEARCH
Innovative Academy Research Support Center
IF = 7.899 www.in-academy.uz

BASIC SCHEMES OF ENERGY AND PUMPING SYSTEMS BASED ON RENEWABLE ENERGY SOURCES USED IN IRRIGATION SYSTEMS

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https://doi.org/10.5281/zenodo.15728877

ARTICLE INFO
Received: 18th June 2025
Accepted: 23rd June 2025
Online: 24th June 2025
KEYWORDS
Renewable energy sources (RES), small-scale energy and pumping systems, photovoltaic pumping units, optimal rotational speed, electric current, power, and energy capacity.

ABSTRACT
The article examines the main schemes of small-scale energy and pumping devices (KENQ) based on QTEM used in irrigation systems, certain technological schemes of energy and pumping devices in irrigation systems, and the use of energy accumulation devices in small-scale energy systems.

SUG‘ORISH TIZIMIDA QO‘LLANILADIGAN QAYTA TIKLANADIGAN ENERGIYA MANBALARI ASOSIDAGI ENERGETIK VA NASOS QURILMALARINING ASOSIY SXEMALARI

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https://doi.org/10.5281/zenodo.15728877

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Qayta tiklanuvchi energiya manbalari (QTEM), kichik energetik va nasos qurilmalar(KENQ), fotoelektrik nasos qurilmalari (FENQ), optimal aylanish chastotasi, elektr toki, quvvat, energiya miqdori.

ABSTRACT
Maqolada sug‘orish tizimida qo‘llaniladigan QTEM asosidagi kichik energetik va nasos qurilmalar(KENQ) ning asosiy sxemalari, sug‘orish tizimidagi energetik va nasos qurilmalarning ba’zi bir texnologik sxemalari va kichik energetik qurilmalarda energiyani akkumulyatsiyalash qurilmalaridan foydalanish qaralgan.

Sug‘orish tizimida qo‘llaniladigan QTEM asosidagi kichik energetik va nasos qurilmalar(KENQ) ning asosiy sxemalari ularning quvvati, ish rejimiga, nasos qurilmasining

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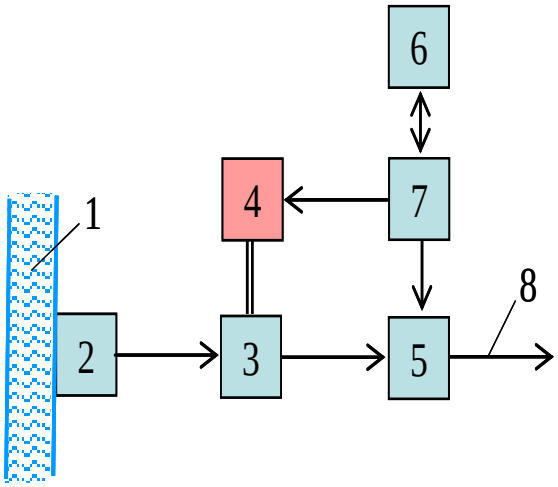
turiga, suvni yetkazib berish talablariga mos ravishda tanlanadi. Optimal sxemani tanlashda energiya manbasining o‘zgaruvchanligi, uning maksimal imkoniyatlari hisobga olinadi.

Sug‘orish tizimidagi energetik va nasos qurilmalarning ba’zi bir texnologik sxemalari 1.1 – rasmda keltirilgan.

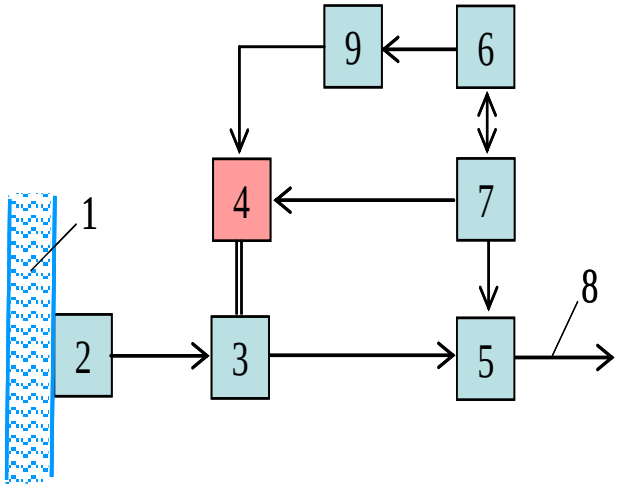
1.1, a – rasmda o‘zgarmas elektr toki asosida ishlaydigan qurilmalarning sxemasi berilgan. Bunday qurilmalarning quvvati odatda 5 kVt gacha bo‘ladi. Bu usulning afzalliklaridan biri elektrodvigatelning aylanishlar sonini talabga muvofiq o‘zgartirish imkoniyati borligidir. Lekin katta quvvatli qurilmalarda bu usulni qo‘llash muammolar bilan bog‘liqligi tufayli bu usul keng tarqalmadi.

Hozirgi kunda aksariyat nasos agregatlari o‘zgaruvchan tokda ishlashi tufayli ikkinchi usul eng keng tarqalgan usul hisoblanadi (1.1,b - rasm). Bu usulda elektrodvigatel belgilangan doimiy aylanishlar soni bilan ishlaydi. Buning afzalligi shundan iboratki, har bir nasosning optimal aylanish chastotasi mavjud bo‘lib, u shu chastotada maksimal f.i.k. qiymatiga ega bo‘ladi. Shu sababli nasoslarga ushbu aylanish chastotasini ta’minlaydigan elektrodvigatel tanlanadi.

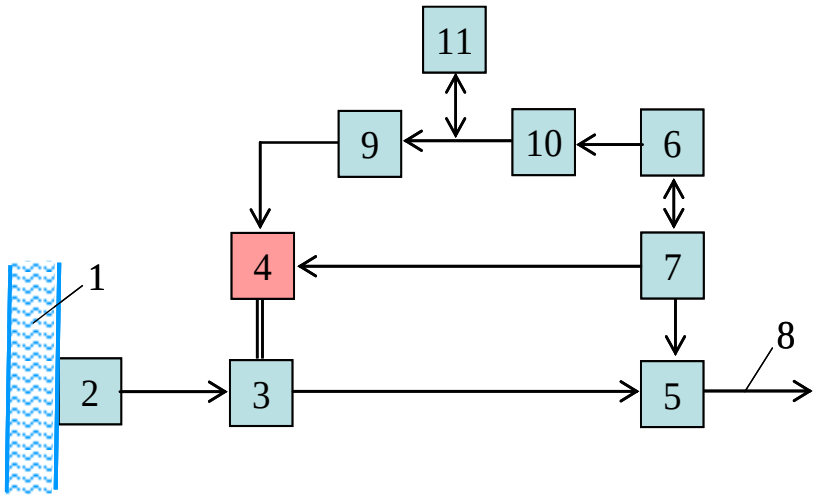
Yuqorida keltirilgan sxemalardan eng samaralisi energiyani akkumulyatsiyalashga mo‘ljallangan sxema hisoblanadi (1.1, v - rasm).



a)



b)



v)

1.1–rasm. Sug‘orish tizimidagi KEQlarning sxemalari

a) nasos elektrodvigateliga o‘zgarmas elektr toki berishga mo‘ljallangan sxema;

b) nasos elektrodvigateliga o‘zgaruvchan elektr toki berishga mo‘ljallangan sxema; *v)* energiyani akkumulyatsiyalashga mo‘ljallangan sxema.

1–suv manbai; 2-suv olish qurilmasi; 3–nasos; 4-nasos elektrodvigateli; 5-suv sarfini rostlash va taqsimlash moslamasi; 6-foto elektrik yoki shamol energetik qurilmasi; 7-boshqaruv pulti; 8-suvni iste’molchiga berish quvuri; 9-invertor; 10-zaryadni nazorat qilish blogi; 11-energiyani akkumulyatsiyalash qurilmasi.

Bu sxemada qayta tiklanadigan energiya manbalarining o‘zgaruvchanligi, ularda ob-havo sharoitiga qarab energetik quvvatning keskin o‘zgarishini hisobga olib energiyani saqlash tizimi ko‘zda tutiladi. Ushbu tizimdan samarali foydalanish uchun sug‘orish muddatlari bilan energiyani yig‘ish muddatlarining bir biriga mos kelmasligini hisobga oladigan optimal texnologik sxema tuziladi va shu sxemaga binoan kunlik, haftalik, oylik va yillik ish grafiklari tuziladi.

Yuqorida keltirilgan sxemalarda energiyani yo‘qolishiga yo‘l qo‘ymaslik, undan maksimal ravishda samarali foydalanish eng asosiy vazifa hisoblanadi. Shu sababli ekinlarni sug‘orish tizimida QTEMdan unumli foydalanish maqsadida ularning energiyasini akkumulyatsiyalash asosida maksimal samaraga erishishini ta’minlaydigan sxemani qabul qilamiz.

Bu sxemaning boshqa sxemalardan farqi shundan iboratki, unda energiyani akkumulyatsiyalash qurilmasi (EAQ)ning mavjudligi hisoblanadi.

Sug‘orish tizimida qo‘llaniladigan FENQlarning asosiy parametrlarini aniqlash: Sug‘orish tizimidagi FENQlarning asosiy parametrlarini aniqlash quyidagi bosqichlarda olib boriladi:

1. Sug‘orish maydoniga zarur bo‘lgan kunlik suv miqdorini aniqlash;
2. Nasosning suv berish unumdorligini va naporini aniqlash;
3. Nasos markasini tanlash;
4. Suv rezervuariga to‘planadigan suv hajmini hisoblash;
5. Belgilangan suv hajmini to‘plash uchun zarur bo‘lgan elektr energiyasi miqdorini hisoblash;
6. FEQning maksimal quvvatini aniqlash.

Sug‘orish maydoni uchun zarur bo‘lgan suv miqdori shu maydon uchun aniqlangan (iqlim, tuproq turi, yer osti suvlarining joylashishi va ekin turi bo‘yicha) sug‘orish meyoriga bog‘liq ravishda aniqlanadi

$$V = m \cdot \omega, \ m^3 \qquad (2.1)$$

bunda m – sug‘orish meyori (bir marta sug‘orish uchun), m^3/ga; ω -sug‘orish uchun belgilangan yer maydoni, ga.

Sug‘orish mavsumi davomida ekin maydonini sug‘orish 4...9 marta amalga oshirilishi mumkin, unda mavsum davomida sarf bo‘ladigan suv miqdori quyidagicha aniqlanadi:

$$M = V \cdot n, \ m^3 \qquad (2.2)$$

bunda, n - sug‘orishlar soni

Masalan, pomidorni Qashqadaryo viloyati sharoitida sug‘orish uchun bir mavsumda o‘rtacha 5500 m^3/ga suv kerak bo‘ladi, bunda sug‘orishlar soni 9 ta, demak har sug‘orishga

600...700 m³/ga suv kerak bo‘ladi. Sug‘orish mavsumi 1 maydan 10 oktabrgacha davom etadi [85;78-95-b.].

FEQ energiyasidan maksimal foydalanish uchun sug‘orishning kun davomidagi muddatlarini to‘g‘ri tanlash zarur.

Respublikamiz sharoitida sug‘orish mavsumi davomida ko‘p o‘simliklarni suvning bug‘lanishi va transpiratsiya miqdorini kamaytirish uchun kechqurun, tongda va kechasi sug‘orish tavsiya etilgan [86;22-b.]. Shu sababli kunduzi quyosh radiatsiyasi faol bo‘lgan soatlarda FEQ energiyasi to‘lik nasos agregatiga berilib, kerakli miqdordagi, ya’ni (2.1) formula bilan hisoblanadigan suv hajmi rezervuarda to‘planadi. Demak, suv rezervuari hajmi $V_{rez} = V$ bo‘lishi kerak.

Nasos suv berish unumdorligining o‘rtacha qiymatini quyidagi tarzda hisoblashimiz mumkin:

$$Q = V/t\,, \quad m^3/c \qquad (2.3)$$

bunda t – bir marta sug‘orish davomiyligi, t

ning qiymati ekin turiga qarab meyorlarga bog‘liq ravishda olinadi [85;78-95-b.].

Nasos geometrik napori suv manbaidagi suv sathi bilan suv rezervuaridagi suv sathlarining farqiga asosolanib aniqlanadi (2.2 - rasmga qarang)

$$H_G = \nabla C_{rez} - \nabla C_{man} \qquad (2.4)$$

Nasosning to‘liq napori quyidagi formula bilan hisoblanadi

$$H = H_G + \Delta H \qquad (2.5)$$

bunda ΔH - nasosning suv manbaidan suv rezuvuarigacha bo‘lgan masofadagi quvurlar tizimida yo‘qolgan napor qiymati va bu qiymat gidravlik hisoblar yordamida aniqanadi.

Nasosga beriladigan elektr energiyasi miqdorini kamaytirish uchun H_G qiymati iloji boricha kichik bo‘lishi kerak, lekin quvurlarda yetarli naporni ta’minlash maqsadida H_G =10...20 metr bo‘lishi maqsadga muvofiq [10;223-b].

Nasos uchun zarur bo‘lgan iste’mol quvvati quyidagi formula bilan hisoblanadi

$$N_N = 9{,}81\, Q\, H/\eta, kVt \qquad (2.6)$$

bunda η – nasos f.i.k., Q – nasos suv berish unumdorligi, m³/s.

V hajmdagi suvni rezervuarga haydab berishda nasos agregatiga kerak bo‘lgan energiya miqdori quyidagicha aniqlanadi.

$$Э_N = 9{,}81 \int_{t_1}^{t_2} Q(t) H(t) \eta^{-1}(t)\, dt; \qquad (2.7)$$

bunda t_1 va t_2 – nasos agregatining ishlash vaqtining boshlanishi va tugashi soatlari (bu vaqt quyosh faolligi soatlari bilan belgilanadi).

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