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RESEARCH, INNOVATION, RESULTS



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The Journal of Transport showcases groundbreaking scientific and applied research conducted by transport-oriented universities, higher educational institutions, research centers, and institutes both within the Republic of Uzbekistan and globally. Recognized for its academic rigor, the journal is included in the prestigious list of scientific publications endorsed by the decree of the Presidium of the Higher Attestation Commission No. 353/3 dated April 6, 2024. This inclusion signifies its role as a vital repository for publishing primary scientific findings from doctoral dissertations, including Doctor of Philosophy (PhD) and Doctor of Science (DSc) candidates in the technical and economic sciences.

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Articles are published in Uzbek, Russian, and English, ensuring a wide-reaching audience and fostering cross-cultural academic exchange. As a beacon of academic excellence, the "Journal of Transport" continues to serve as a vital conduit for knowledge dissemination, collaboration, and innovation in the transport sector and related fields.

Method of abrasive grinding and reduction of centrifugal two-way "D" type pumps

O.G. Chulponov¹^a, B.A. Mamadov¹^b

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Abstract:

This article discusses the sludge passing through double-entry "D" type pumps, which constitute the largest part of the pumping stations and devices for water supply for agriculture, causing severe abrasive wear of their internal parts. As a result, the characteristics of the pumps change, namely, water consumption-Q, pressure-N, useful efficiency- η and the maintenance interval decrease. According to the operating rules of double-entry pumps, only 0.1% of sludge with a size of 0.1 mm should pass through these pumps. The amount of sludge of a size that cannot pass through the pump is 47.2%, and in the pumping station unit it is 47.32%. The results obtained show that the size and amount of abrasive sludge in all water sources are several times larger than the size and amount of sludge that can pass through the pumps. It has been shown that parts of various types of pumps in all pumping stations and installations installed throughout the territory of our republic are susceptible to abrasive corrosion.

Keywords:

centrifugal pumps, pumping stations, pump impeller, abrasive wear

Markazdan qochma ikki tomonlama "D" turdagi nasoslarni abraziv yemirilishi va ularni kamaytirish usuli

Cho'lonov O.G.¹^a, Mamadov B.A.¹^b

¹ Namangan davlat texnika universiteti, Namangan, O'zbekiston

Annotatsiya:

Ushbu maqolada Qishloq xo'jaligi uchun suv ko'tarib beradigan nasos stantsiyalari va qurilmalaridagi eng ko'p qismini tashkil qilayotgan ikki tomonlama suv kiruvchi "D" turdagi nasoslardan o'tayotgan ushbu loyqalar, ularning ichki qismlarini kuchli abraziv yemirilishga olib kelmoqda. Natijada nasoslarning xarakteristikalarini o'zgarib ketadi, ya'ni suv sarfi-Q, bosimi-N, foydali ish koeffitsienti- η va ta'mirlasharo muddati kamayib ketadi. Ikki tomonlama suv kiruvchi nasoslarni ekspluatatsiya qilish qoidalariga asosan, bu nasoslardan kattaligi 0,1 mm bo'lgan loyqalarning atigi 0,1 % o'tishi lozim. Nasosdan o'tishi mumkin bo'lmagan kattalikdagi loyqalar miqdori-47,2% ni nasos stantsiyasi agregatida-47,32% ni tashkil qilmoqda. Olingan natijalar suv manbalarining barchasida abraziv loyqalarning kattaligi va miqdori, nasoslardan o'tishi mumkin bo'lgan loyqalar kattaligi va miqdoridan bir necha barobar katta. respublikamiz hududi bo'ylab o'rnatilgan barcha nasos stantsiyalari va qurilmalaridagi har xil turdagi nasoslarning qismlari, abraziv yemirilishga uchrashi mumkinligi ko'rsatilgan.

Kalit so'zlar:

markazdan qochma nasoslar, nasos stantsiyalari, nasosning ish g'ildiragi, abraziv yemirilish

1. Kirish

Mamlakatimiz hududida mo'tadigan asosiy suv manbalarining (Amudaryo, Sirdaryo, Zarafshon) suvlari, o'zi bilan juda ko'p miqdorda suvga aralashib muallaq holda va o'zan tubida sudralib harakatlanayotgan loyqalarni keltiradi. Qishloq xo'jaligi uchun suv ko'tarib beradigan nasos stantsiyalari va qurilmalaridagi eng ko'p qismini tashkil qilayotgan ikki tomonlama suv kiruvchi "D" turdagi nasoslardan o'tayotgan ushbu loyqalar, ularning ichki qismlarini kuchli abraziv yemirilishga olib kelmoqda.

Natijada nasoslarning xarakteristikalarini o'zgarib ketadi, ya'ni suv sarfi-Q, bosimi-N, foydali ish koeffitsienti- η va ta'mirlasharo muddati kamayib ketadi. 2-rasmda Amudaryoning nasos stantsiyasi suv oladigan stvoridan hamda «Amu-Zang-2» nasos stantsiyasi 8-agregat

salnigidan chiqqan loyqaning donadorlik tarkib ko'rsatilgan. Ikki tomonlama suv kiruvchi nasoslarni ekspluatatsiya qilish qoidalariga asosan, bu nasoslardan kattaligi 0,1 mm bo'lgan loyqalarning atigi 0,1 % o'tishi lozim. 1-rasmdan ko'rinish turibdiki: Amudaryoda nasosdan o'tishi mumkin bo'lmagan kattalikdagi loyqalar miqdori - 47,2% ni nasos stantsiyasi agregatida- 47,32%ni tashkil qilmoqda. Bundan ko'rinish turibdiki, mamlakatimiz hududidan oqib o'tdigan suv manbalarining barchasida abraziv loyqalarning kattaligi va miqdori, nasoslardan o'tishi mumkin bo'lgan loyqalar kattaligi va miqdoridan bir necha barobar katta. Demak, respublikamiz hududi bo'ylab o'rnatilgan barcha nasos stantsiyalari va qurilmalaridagi har xil turdagi nasoslarning qismlari, abraziv yemirilishga duchor bo'lishi muqarrardir.

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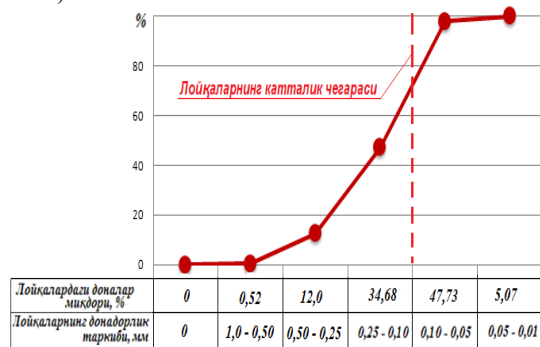


2. Tadqiqot metodologiyasi

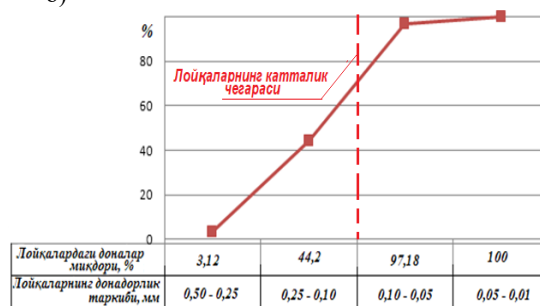
Nasoslarni abraziv yemirilishini quyidagi usullarda kamaytirish mumkin:

- nasos stantsiyalariga suv olib keluvchi kanallarga tindirgichlar o'rnatib, nasoslardan o'tishi mumkin bo'lmagan kattalikdagi loyqalarni tutib qolish;
- abraziv yemirilishga qarshi mustahkam materiallardan nasos va uning qismlarini tayyorlash;
- nanotexnologiya asosida abraziv yemirilishga chidamli har xil materiallar ishlab chiqish va ulardan nasos hamda uning qismlarini tayyorlash;
- nasos va uning qismlari konstruksiyalariga o'zgartirishlar kiritish va boshqalar.

a)



b)



1-rasm. Amudaryo va nasos stantsiyasidan olingan loyqalarning tarkibi: a- Amudaryodan olingan loyqaning hamda; b-«Amu Zang-2» nasos stantsiyasi 8-agregat salnigidan chiqqan loyqaning donadorlik tarkibi

Abraziv yemirilishga qarshi ishlab chiqilgan usul va konstruksiyalarni sinab ko'rish, dala va laboratoriya sinovlari orqali olib boriladi.

Nasos stantsiyasidagi nasoslarni abraziv yemirilishini tadqiq qilish uchun dala sinovlari, Namangan "Nasos stantsiyalari va energetika" boshqarmasi tasarrufida bo'lgan Namangan tumanidagi "Yangi yer" nasos stantsiyasida olib borildi.

3. Natijalar

Ushbu nazariy tadqiqotda Nasos stantsiyasiga "D" turdagi 1D1600-90 markali nasoslar o'rnatilgan. Ushbu markadagi nasoslar ikki xil aylanishlar sonida ($n_1=980$ va $n_2=1450$ ayl./min.) hamda uch xil diametrlilik ish g'ildiraklari bilan ishlab chiqariladi. Nasoslarning asosiy ko'rsatkichlari 1 va 2-jadvalda, ishchi xarakteristikalar 2-rasmda keltirilgan.

Bundan tashqari Nasos ichidagi oqimning abraziv zarralar bilan o'zaro ta'sirini DEM (Discrete Element

Method) yordamida kompyuterda modellashtirish kerak. Yuzalardagi yemirilish o'choqlarining aniq topib ishlab chiqish kerak. Nasos ichidagi yemirilishni oldindan aniqlash uchun quyidagi ishlarni bajarish lozimdir.

1. vibratsiya datchiklari
2. bosim sensori
3. akustik monitoringni qo'llab,

Nasosdagi emirilishini erta ogohlantirish tizimi yaratish kerak bo'ladi.

1-jadval

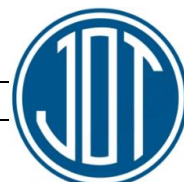
1D 1600-90 markali nasoslarning asosiy ko'rsatkichlari

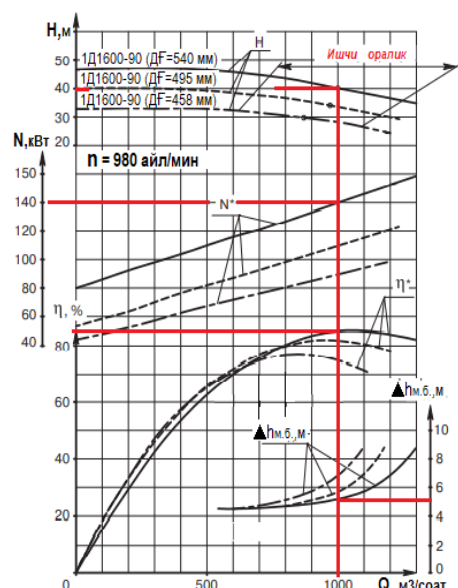
Naso s-ning Markasi	Q, m ³ /soat	N _u , m	n, ayl./min	η, F.I. K	n, ayl./min	N, kVt·soat	D _{is} _h g'il., m	Δh _{m.b.} , m	G, kg
1D 1600-90	1000	40,0	980	85	98	140	540	5	1165
1D 1600-90	1584	56,0	14	89	14	480	540	7	1165

2-jadval

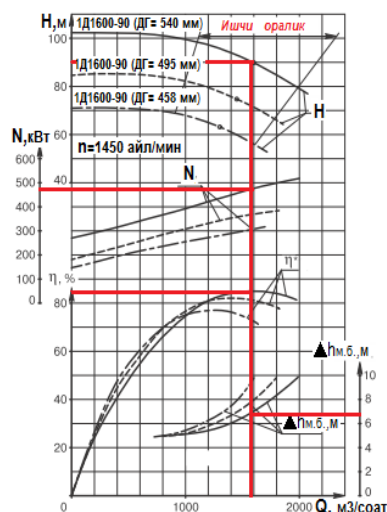
Barcha turdagi 1D1600-90 markali nasoslarning asosiy ko'rsatkichlari

Naso s-ning markalari	Q, m ³ /soat (m ³ /s)	N, m	n, ayl./min	η, FIK	N, kVt·soat	D _{is} _h g'il., m	Δh _{m.b.} , m	G, kg
					nomi	maks		
1D160-90	1000(0,280)	40		85	140	155	540	5,0
1D160-90a	970(0,269)	34	980	82	104	118	495	5,1
1D160-90b	870(0,242)	30		77	84	90	458	5,2
1D1600-90	1600(0,445)	90		85	470	520	540	7,0
1D160-90a	1450(0,403)	75	1450	82	360	380	495	7,1
1D160-90b	1300(0,360)	63		77	280	290	458	7,2





b)



2-rasm. 1D1600-90 markali nasosning
xarakteristikalar: a-aylanishlar soni- $n_1=980$ ayl/daq;
b-aylanishlar soni- $n_2=1450$ ayl/daq

4. Xulosa

Mamlakatimiz hududidagi barcha suv manbalaridagi loyqalar miqdori va kattaligi, nasosdan o'tishi mumkin bo'lgan loyqalar miqdori va kattaligidan bir necha o'n barobar ko'pdir.

2. Suv manbalariga o'rnatilgan barcha nasos stantsiyalaridagi nasoslar, abraziv yemirilishga molikdir.

3. Eksperimental sinovlar shuni ko'rsatdiki, nasosning standart po'lat materiali abraziv aralashmalarga nisbatan past chidamlilikka ega bo'lib, uni keramik, nanokompozit va tungsten-karbid qoplamalar bilan himoyalash yemirilishni sezilarli darajada kamaytiradi.

4. Qoplamalar ichida tungsten-karbid eng yuqori samaradorlikni namoyon etib, ish sharoitiga qarab yemirilishni 70–85% gacha kamaytirishga imkon berdi.

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R. Mavlonov, S. Numanova

Strength and crack resistance of steel and bfrp hybrid reinforced concrete beams.....176

I. Yuldashev, Sh. Yuldashev

On another method for assessing effectiveness indicators of emergency response.....182

Sh. Yuldashev, Kh. Makhmudov

Analysis of the material composition and structural properties of road milling machine teeth.....185

B. Khasanov

Analysis of the development and structural structure of the electric vehicle market.....189

Z. Alimova, G. Niyazova

Oil quality studies of hydraulic systems of agricultural machinery in conditions of dusty air.....194

R. Dadaboev

Developing a mathematical model of the fuel supply system for injection engines.....198

O. Chulponov, B. Mamadov

Method of abrasive grinding and reduction of centrifugal two-way "D" type pumps.....202

Z. Kholboev

Study of the stress-strain state of the Varzyk dam, taking into account its own weight, hydrostatic pressure and soil moisture content.....205