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METHODS OF COMBATING ALIEN AQUATIC ORGANISMS

Abstract

Preventing the entry and managing the numbers of alien species is the most important task in the system of principles for the conservation of biological diversity. This article reflects the relevance and importance of preserving biological diversity, reflects the importance of developing measures to reduce the damage caused by the introduction of alien species, reflects individual methods of combating alien fish species in world practice.

Complex control of alien aquatic organisms, combining several methods, often provides the most effective and acceptable control. Today, to preserve the quality of the environment, concerted efforts are required for effective and pragmatic management. The authorities and the public should remember and realize that the consequences of the invasion of alien aquatic organisms will lead to a significant loss of our own biological diversity and degradation of ecosystems.

There are a huge number of specific methods of dealing with alien aquatic organisms. Given the complex mechanism of the ecosystem, when choosing methods to combat alien aquatic organisms, one should be treated with extreme caution. To date, all methods and methods of combating alien aquatic organisms can be conditionally combined into three main groups: mechanical, biological and chemical. Which is the subject of this article.

Key words: biological diversity, introduction, alien (adventitious) species, invasion, native reservoir, ecosystem, native (native) species, methods of combating alien aquatic organisms.

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CALCULATION TO DETERMINE THE TECHNICAL AND ECONOMIC EFFICIENCY OF PUMPING UNITS FOR LIFTING WATER FROM WATERCOURSES POWERED BY WATER ENERGY FOR WATERING PASTURES AND IRRIGATION OF LAND

Abstract

The problem of effective water supply using natural energy resources of water in modern conditions is promising and relevant, the solution of which is rationally carried out from watercourses with the necessary standard sizes of a hydraulic ram pumping unit, the design of which has a novelty.

At the Kazakh National Agrarian Research University conducted applied research to improve the efficiency of water supply from watercourses in the system of irrigation of lands and irrigation of pastures of peasant and farm farms of the agro-industrial complex of the Republic of Kazakhstan through the development of an improved hydraulic ram pumping unit with an increase in its energy indicators: hydraulic shock pressure, supply, pressure and efficiency.

This article presents a calculation to substantiate the economic efficiency of the studies carried out on the use of the necessary standard sizes of an improved hydraulic ram pumping unit (NUV-7-12 and NUV-17-20) for water supply to peasant and farm farms of the Republic of Kazakhstan and irrigation of lands located in areas of adjacent watercourses, compared with basic pumping units (AN - 2K - 9 - M1 and ANS-60 D).

Key words: *pumping unit powered by water energy, watercourse, calculation, technical and economic efficiency, balance price, annual output, unit operating costs, annual economic effect, total effect, payback period of capital investments.*

Introduction

The economic efficiency of the research performed largely depends on the effectiveness of the adopted technology and the developed pumping units for watering pastures and irrigation of land working on it, therefore it is necessary to adopt a methodology based on comparing the efficiency of newly developed pumping units compared with similar basic pumping units in terms of technological process and purpose.

The developed three standard sizes of advanced hydraulic ram pumping units are designed for lifting water from watercourses, for the purpose of watering pastures (one standard size NUV-7-12) and irrigation of land (two standard sizes NUV-17-20 and NUV-35-20).

The field of application is the agricultural water supply of agricultural facilities of the Republic of Kazakhstan (peasant and farm farms and other agricultural formations) in areas with watercourses during the spring, summer and autumn periods of use. The distinctive features of a hydraulic ram pumping unit are the lifting of water using energy-saving and environmentally friendly water lifting technology by using the kinetic energy of the water flow in watercourses (geometric and high-speed heads) to drive and create hydraulic shock pressure in the supply pipeline from the periodic closing and opening of the hydraulic shock valve installed in it, as a result of which the supply and pressure in the pumping unit are created [1,2,3].

Methods and materials

The calculation of the economic efficiency of an improved sample of a hydraulic ram pumping unit was performed using special methods [4-7] using initial data on the developed standard sizes of the new pumping unit and the technical characteristics of the basic pumping units [8-10] and taking into account market prices on 03/07/2023.

Currently, traditional centrifugal pumping units of the AN-2K-9-M1 and ANS-60D brands are mainly used for mechanization of water supply to peasant and farm farms from open water sources, including from watercourses of the agro-industrial complex of the Republic of Kazakhstan and irrigation of lands (parameters: supply-20-60 m^3/h, head -13-21.5m) driven by a pump from gasoline internal combustion engines 2SD-M2 with a capacity of 1.5kW and UD-2 with a capacity of 5.9 kW. There are currently no other alternative installations using watercourses to drive kinetic energy of water in production.

As basic pumping units according to the main parameters (supply and pressure), the following are accepted: for watering pastures - the AN-2K-9-M1 pumping unit with a pump drive from a 2SD-M2 gasoline internal combustion engine with a capacity of 1.5 kW, and for irrigation of lands - the ANS-60D pumping unit with a pump drive from the gasoline internal combustion engine UD-2 with a capacity of 5.9 kW, which are mass-produced by the industry and are available on the domestic market.

The calculation of the economic efficiency of the development consisted in determining the main technical and economic indicators of the proposed pumping units for the new technology of water lifting from watercourses and basic pumping units for traditional water lifting technology:

balance prices, annual output and annual loads; specific operating costs: deductions for renovation, repair and maintenance, salary and fuel costs; specific capital investments and labor costs, specific energy costs; the annual economic effect per installation and the total area and payback period of capital investments.

The economic effect of the developed standard sizes of hydraulic ram pumping units will be obtained mainly by reducing operating costs from incomplete use of maintenance personnel and saving fuel

Results and discussion

The calculated indicators for the feasibility study of the efficiency of the NU V-7-12 hydraulic ram pumping unit are shown in Table 1.

Table 1-Technical and economic performance indicators of a hydraulic ram pumping unit for watering pastures NUV-7-12

№	Name of indicators	Designation	Unit of measurement	The value of the indicators	
				according to the technology of the basic pumping unit AN 2K-9-M1	according to the technology of the NUV-7-12 hydraulic ram pumping unit
1	2	3	4	5	6
1.	Supply	Q	m^3/h	7	6,84
2.	Daily water consumption	$q_{сут}$	m^3	36	36
3.	Annual output	$П$	m^3	9540	9540
4.	Annual load	$T_ф$	h	1490	1484
5.	Power consumption	$N_н$	kW	1,1	0,65
6.	Number of service personnel	$Л$	people	1	0,125
7.	Book value of the pumping unit	$Ц_Б$	tenge	59986	63734
8.	Deductions for renovation	C_a	tenge/ m^3	1,04	1,11
9.	Repair and maintenance costs	C_p	tenge/ m^3	0,35	0,37
10.	Fuel and lubricants costs	$C_т$	tenge/ m^3	14,13	-
11.	Salary costs	$C_з$	tenge/ m^3	22,8	5,67
12.	Specific operating costs	$З_y$	tenge/ m^3	38,32	7,15
13.	Specific capital investments	$К_y$	tenge/ m^3	6,29	6,68
14.	Annual operating costs of the basic and new pumping units	$C_б$ $C_н$	tenge	609129	68211
15.	Reduced operating costs	$\dfrac{З_{y.баз}}{З_{y.нов}}$	time	-	8,93
16.	Payback period	$T_{ок}$	year	-	0,10
17.	Annual effect	$Э_г$	tenge	-	540918
18.	The economic effect of software development in the Republic of Kazakhstan	$Э$	million tenge	-	5 517

It follows from Table 1 that the developed NUV-7-12 hydraulic ram pumping unit, compared with the basic AN-2K-9-M1 pumping unit, reduces operating costs by 8.9 times, due to which the annual effect of the application can amount to 540918 tenge, and the payback period is 0.1 years and the overall effect of the development of the RK – up to 5,517 million tenge, which confirms its prospects and the need to implement it in the pasture water supply system when raising water from watercourses at the facilities of the agro-industrial complex of the Republic of Kazakhstan.

Calculation of the main indicators of the new improved hydraulic ram pumping unit for irrigation of lands NUV-17-20.

The annual output and the standard annual load are assumed to be equal to the basic pumping unit ANS-60D: N = 37100 m^3 of raised water, Tn = 1855 hours.

Indicators of economic efficiency of a hydraulic ram pumping unit for irrigation of lands NUV-17-20.

The annual economic effect of using a hydraulic ram pumping unit for irrigation of lands NUV-17-20 (standard size 1) in comparison with the basic pumping unit ANS-60D is determined by the formula (19):

$$Э_г = (З_{у.баз} - З_{у.нов})· П = (39,21 - 3,5)· 37100 = 1\ 324\ 841 \text{ tenge,}$$

The required number of hydraulic ram pumping units NU V-17-20 (standard size 1) for irrigation is predicted taking into account the number of peasant and farm farms located in the zones of watercourses according to the formula (20):

$$i = \frac{Z·K}{i_t} = \frac{170000·0,30}{5} = 10\ 200 \text{ pcs}$$

where: i – the number of peasant and farm farms located in the area of watercourses in the Republic of Kazakhstan (i=17000), pcs.;

K - the coefficient of irrigation of lands in the zones of watercourses, $K = 0,30$;

i_t- the number of standard sizes of developed and existing pumping units for lifting water from watercourses, $i_t = 5$ pcs

The economic effect of the required number of new hydraulic ram pumping units NUV-17-20 (standard size 1) for irrigation of land may be in the Republic of Kazakhstan:

$$Э= 1\ 324841 · 10200 = 13\ 513\ 378\ 200 \text{ tenge}$$

The reduction of operating costs is determined by the formula (21):

$$\frac{З_{у.баз}}{З_{у.нов}} = \frac{39,21}{3,5} = 11,2 \text{ time,}$$

The payback period of the new pumping unit is calculated using the formula (22):

$$Т_{ок} = \frac{К_н}{С_б} = \frac{К_н}{С_н + Э_г} = \frac{204468}{129850 + 1\ 324\ 841} = 0,14 \text{ years}$$

where: $К_н$– capital investments in the proposed pumping plant:

$$К_н = Ц_{Б.НОВ} = 204468 \text{ tenge;}$$

$С_б$, $С_н$ - the annual operating costs of the basic and proposed pumping units, determined by the formula:

$$С_б = З_{у.баз}· П = 39,21· 37100 = 1\ 454\ 691 \text{ tenge;}$$
$$С_н = З_{у.нов}·П = 3,5·37100 = 129\ 850 \text{ tenge;}$$

The calculated indicators for the feasibility study of the effectiveness of the hydraulic ram pumping unit for irrigation of lands NUV-17-20 are shown in Table 2.

Table 2-Technical and economic performance indicators of the hydraulic ram pumping unit for irrigation of lands NUV-17-20 (standard size 1)

№	Name of indicators	Designation	Unit of measurement	The value of the indicators	
				basic pumping unit ANS-60D	hydraulic ram pumping unit NUV-17-20
1	2	3	4	5	6
1.	Supply	Q	m³/h	20	17,7
2.	Daily water consumption	$q_{сут}$	m³	140	140
3.	Annual output	П	m³	37100	37100
4.	Annual load	$Т_ф$	h	2038	2183
5.	Power consumption	$N_н$	kW	3,7	2,8
6.	Number of service personnel	Л	people	1	0,125
7.	Book value of the pumping unit	$Ц_Б$	tenge	359 700	204 468
8.	Deductions for renovation	$С_а$	tenge/ m³	1,61	0,91
9.	Deductions for repairs and maintenance	$С_р$	tenge/ m³	0,75	0,45
10.	Fuel and lubricants costs	$С_т$	tenge/ m³	20,87	-
11.	Salary deductions	$С_з$	tenge/ m³	16,02	2,14
12.	Specific operating costs	$З_у$	tenge/ m³	39,21	3,5
13.	Specific capital investments	$К_у$	tenge/ m³	9,69	5,51
14.	Annual operating costs of the basic and proposed pumping units	$С_б$ $С_н$	tenge	1 454 691	129 850

15.	Reduced operating costs	$\dfrac{З_{у.баз}}{З_{у.нов}}$	time	-	11,2
16.	Payback period	$T_{ок}$	year	-	0,14
17.	Annual economic effect	$Э_{г}$	tenge	-	1 324 841
18	The economic effect of the development	Э	million tenge	-	13 513

It follows from table 2 that the proposed design of the NUV-17-20, compared with the basic pumping unit ANS-60D, reduces operating costs by 11.2 times, the annual effect of the application is 1,324,841 tenge, the payback period is 0.14 years, the total effect in Kazakhstan will be up to 13,513 million tenge. this confirms its prospects and the need to implement it in the reclamation system when lifting water from watercourses at the facilities of the agro-industrial complex of the Republic of Kazakhstan.

Conclusions

The performed calculation to substantiate the economic efficiency of the performed studies showed that the use of the necessary standard sizes of the improved hydraulic ram pumping unit NUV-7-12 and NUV-17-20 for water supply to peasant and farm farms of the Republic of Kazakhstan and irrigation of lands located in the zones of adjacent watercourses, compared with the basic pumping units AN - 2K - 9 - M1 and ANS-60 D, respectively, reduce operating costs by 8.9 and 11.2 times, due to which the annual effect of the application can amount to 540918 tenge and 1,324,841 tenge per installation with a payback period of no more than a year. The projected efficiency of development in the Republic of Kazakhstan may amount to 5.5 and 13.5 billion tenge.

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ЖАЙЫЛЫМДАРДЫ СУЛАНДЫРУ ЖӘНЕ ЖЕРДІ СУАРУ ҮШІН СУ ЭНЕРГИЯСЫНАН ЖЕТЕГІ БАР СУ АҒЫНДАРЫНАН СУДЫ КӨТЕРУГЕ АРНАЛҒАН СОРҒЫ ҚОНДЫРҒЫЛАРЫНЫҢ ТЕХНИКАЛЫҚ-ЭКОНОМИКАЛЫҚ ТИІМДІЛІГІН АЙҚЫНДАУ ЖӨНІНДЕГІ ЕСЕП

Аңдатпа

Қазіргі жағдайда судың табиғи энергетикалық ресурстарын пайдалана отырып, тиімді сумен жабдықтау проблемасы перспективалы және өзекті болып табылады, оның шешімін су ағындарынан дизайны жаңалығы бар гидротаран сорғы қондырғысының қажетті стандартты өлшемдерімен ұтымды жүзеге асыру қажет.

Қазақ ұлттық аграрлық зерттеу университетте жерді суару және ҚР АӨК шаруа және фермер қожалықтарының жайылымдарын суландыру жүйесіндегі су ағындарынан сумен жабдықтаудың тиімділігін арттыру бойынша қолданбалы зерттеулер жүргізілді, оның энергетикалық көрсеткіштерін арттыра отырып, жетілдірілген гидротаран сорғы қондырғысын әзірлеу арқылы: су соққысы қысымы, беру, қысым және тиімділік.

Бұл мақалада ҚР шаруа және фермер қожалықтарын сумен жабдықтау және базалық сорғы агрегаттарымен (АН-2К -9-М1 және АНС-60 Д) салыстырғанда іргелес су ағындары аймақтарында орналасқан жерлерді суару үшін жетілдірілген гидротаран сорғы қондырғысының (НУВ-7-12 және НУВ - 17-20) қажетті типтік өлшемдерін қолдану бойынша орындалған зерттеулердің экономикалық тиімділігін негіздеу бойынша есеп берілген.

Кілт сөздер. су энергиясымен жұмыс істейтін сорғы қондырғысы, су ағыны, есептеу, Техникалық-экономикалық тиімділік, баланстық баға, жылдық өндіріс, меншікті пайдалану шығындары, жылдық экономикалық әсер, жиынтық әсер, инвестициялардың өтелу мерзімі.

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РАСЧЕТ ПО ОПРЕДЕЛЕНИЮ ТЕХНИКО – ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ НАСОСНЫХ УСТАНОВОК ДЛЯ ПОДЪЁМА ВОДЫ ИЗ ВОДОТОКОВ С ПРИВОДОМ ОТ ВОДНОЙ ЭНЕРГИИ ДЛЯ ОБВОДНЕНИЯ ПАСТБИЩ И ОРОШЕНИЯ ЗЕМЕЛЬ

Аннотация

Проблема эффективного водоснабжения с использованием естественных энергетических ресурсов воды в современных условиях перспективна и актуальна, решение которой рационально осуществить из водотоков необходимыми типоразмерами гидротаранной насосной установки, конструкция которой имеет новизну.

В Казахском национальном аграрном исследовательском университете проведены прикладные исследования по повышению эфективности водоснабжения из водотоков в системе орошения земель и обводнения пастбищ крестьянских и фермерских хозяйств АПК РК посредством разработки усовершенстованной гидротаранной насосной установки с повышением её энергетических показателей: гидроударного давления, подачи, напора и КПД.

В данной статье представлен расчёт по обоснованию экономической эффективности выполненных исследований по применению необходимых типоразмеров усовершенствованной гидротаранной насосной установки (НУВ-7-12 и НУВ-17-20) для водоснабжения крестьянских и фермерских хозяйств РК и орошения земель, расположенных в зонах прилегающих водотоков, по сравнению с базовыми насосными агрегатами (АН - 2К - 9 - М1 и АНС-60 Д).

Ключевые слова. насосная установка с приводом от водной энергии, водоток, расчёт, технико-экономическая эффективность, балансовая цена, годовая выработка, удельные эксплуатационные затраты, годовой экономический эффект, суммарный эффект, срок окупаемости капвложений.

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ПОВРЕЖДЕНИЕ ЯБЛОНИ СИВЕРСА БОЯРЫШНИКОВОЙ ЛИСТОВЕРТКОЙ В ИЛЕЙСКОМ И ЖЕТЫСУЙСКОМ АЛАТАУ

Аннотация

В статье приведены данные о результатах исследования по изучению вредоносности и распространению боярышниковой листовертки на территории Иле-Алатауского и Жонгар Алатауских государственных национальных парков. Стоит отметить о необходимости изучения распространения и влияния боярышниковой листовертки (*Cacoecia crataegana* Hb.), так как данный вид наносит значительный вред яблоне Сиверса на данных территориях. Основной целью исследования является выявление степени повреждаемости боярышниковой листовертки (*Cacoecia crataegana* Hb.) для применения своевременной меры борьбы с данным вредителем яблони Сиверса. В результате исследования были составлены карты распространения и влияния, также была подготовлена карта-схема вредоносности на данных территориях. В результате исследования был проведен сравнительный анализ Илейского и