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Calculation of the Resources Saving Water Lifters With Low Pressure

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ABSTRACT: In this article provided analysis of resource saver water lifting facilities which aimed to use for irrigated agriculture. Based on the analysis, for construction of the water-lifting device were simplified its construction, based on the using water energy for the place of other energy set up the device with the goal of to save energy and improve the efficiency of the device. For the using water lifters requires external sources of energy. In the roposed siphon water lifter, the water lifting process is carries with using flow energy of the same stream. The regime of work of this water lifter is based on the use of vacuum-producing possibility of the equipment.

KEYWORDS: Flow, water lifter, discharge, pressure, vacuum, siphon.

I. INTRODUCTION

Today, great attention is given to use renewable resource saving technologies in irrigated agriculture in the world. In this regard, one of the main issues is the improvement of the water transmission and lifting equipment for the efficiency use of water resources in agriculture. Nowadays main attention in leading countries, including the United States, Canada, Russia, Germany, India, China and our country given to researches about resource saving technics and technologies in water and agriculture [1; 2,3,4].

Effective use of water resources in the world, development of constructive parameters and methods of calculating water lifters in irrigated agriculture, providing scientific researches which directed to improving water-saving technologies and measuring instruments started key role in science and research. In this regard, it is important to improve the design of water transmission devices, water measuring devices, and to develop new constructions At the same time, it is necessary to develop constructive parameters of resource saver water lifting technics for water supply of irrigation fields and creating methods for calculating technics and technologies of water giving and water lifting in effective use and improving water intake from water systems.

II. MAIN PART

The main objective of the Republic of Uzbekistan's agricultural and water management system is to provide the population and national branches with the necessary amount and guaranteed supplies of agricultural products. Resent years, modernizing process of agriculture of our country with different hydraulic systems and machines has been steadily rising. At the same time, water supply to the agricultural sector is also developing. Water in agriculture is used to meet various needs, including drinking water and household needs, livestock complex, farms, primary processing of agricultural products, and various workshops.

Nowadays, demand for small-pressure resource saver technologies of the farms, water user's organizations and individual users are raising. In this case, in this article analyzed the water giving possibility with using energy of the same flow pressure.

Such water lifting devices, which works based on energy-saver ideas, were discussed [4,5,6]. Siphon lifting device (Figure 1) consists of 1 two water tanks which installed in different elevation and interconnecting pipes. The suction pipe 5 of the water tank 2 of the device starts to fill the reservoir 2 and start to fill through the siphon 7. Because the suction pipe 5 is much smaller than the surface of the water passage of the siphon 7, water in the bottom tank 2 goes down.

Decrease of water volume in tank 2 causes the air to shrink in the upper part. Because the upper and lower caps are coupled to the air passage 3, in the upper container also causes the air to split. As a result, through the suction pipe 4 and the valve 8, the top cap 1 is filles with water.

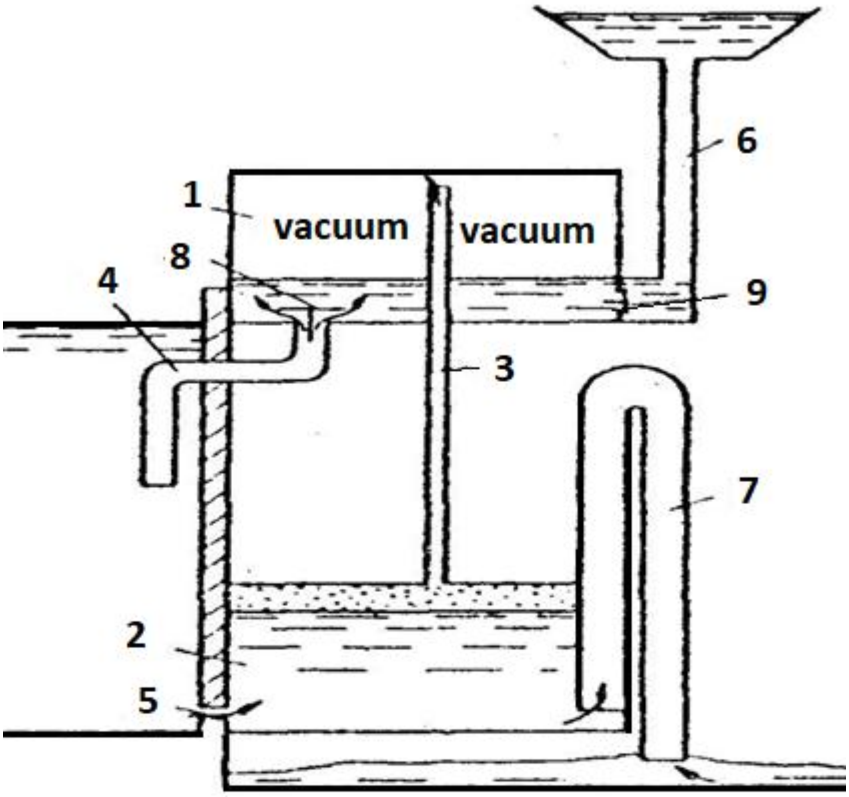

Figure 1. Syphon water lifting scheme.
1 and 2-tank; 3 - air conduit; 4 and 5 - suction pipes; 6 - driving tube; 7 - siphon; 8 and 9 - valves.

When the bottom tank 2 is empty, the siphon stops. When the water flows into it, the pressure in the reservoir 1 increases and the valve 9 will open and water starts to flow through the pressure pipe under pressure. Then the cycle is restores.

Water lifter device which works with the same method which shown in the Figure 2 works as written belove. Water flow supports by the creating vacuum in tank 1 and water flow by the suction pipe 2. For creating the vacuum in tank 1,used the ejector. Water coming down from the upper tank 14 to the active suture of the ejector creates a pinch in the soplo 12. When the tank 1 is full, the pressure in the shaft 8 increases and it rotates around the lead 9 and splits up the water. At the same time, the drain valve is opened and the pressure in the reservoir is atmospheric pressure. Then, with the counterweight 10, the shaft 8 returns to its position and the cycle is repeated.

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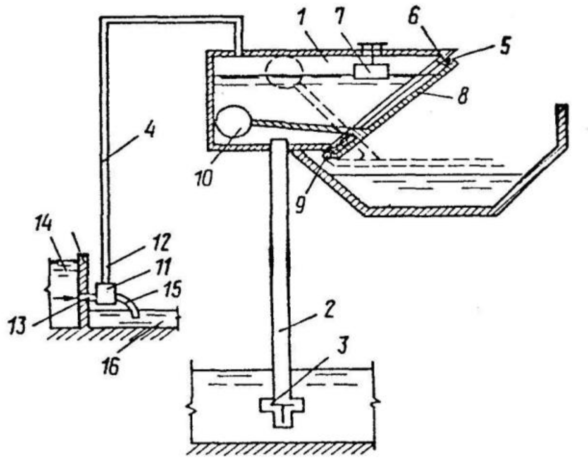

Figure 2. Shaft water lifter scheme.

1 - tank; 2 - suction pipe; 3 - valve; 4 - Vacuum creating pipe; 5 - valve; 6 - wall; 7 - drain valve; 8 - shaft; 9 - lead; 10 - counterweight; 11,12,15 - parts of the ejector; 13 - active soplo; 14 – upper tank; 16 - lower tank.

For the effective use of equipment discussed above, negatively affects their difficult construction and slow procedure of filling with water and water giving.

Based on the above principles, conducted research on water transfer, taking into account the potential and kinetic energy changes of the stream to improve the construction of new siphon. As a result, a new construction of symphonic water lifter [5, 6] were investigated. For efficient use of built-in water lifter requires identification of its performance characteristics. For the purpose of describing the essence of the process and determining the principle of operation, see the scheme in Figure 3.

For the switching on of the tool which shown Figure 3 the siphon is put into operation and the piped tube 4 attached to the siphon pipe is disposed of in the water collection tank 5. In the device, water source is connected to the water supply siphon 1 and pipe 2. The suction pipe connected to the bottom of the water tank is putted to the water, air pumping pipe 4 which installed upstears connected to the lowering part of the syphone pipe. At the same time, when the siphon pipe is started to work, the constant pressure of the water in the downstream network will result in vacuum formation in the air intake pipe connection and in the water reservoir 3, resulting in the absorption of water from the water source to the water tank.

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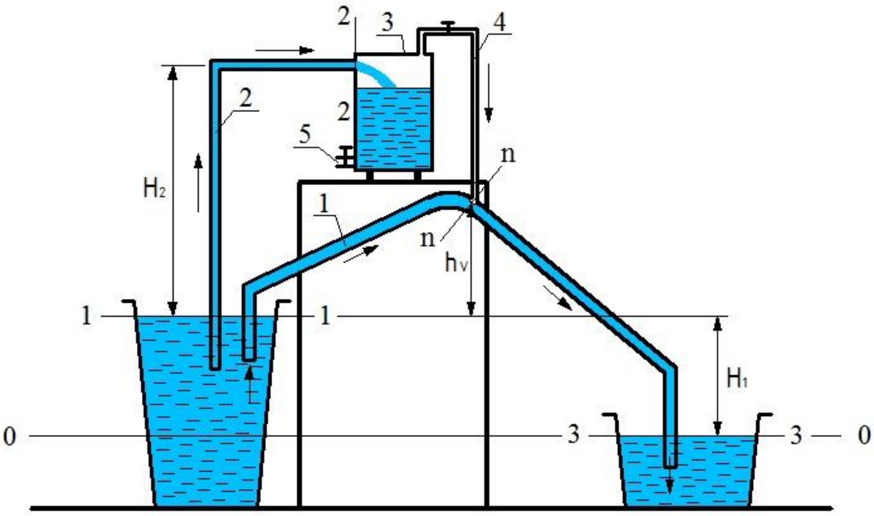

Picture 3. Syphon water lifter scheme

We used the law of hydro-mechanics, including the law of energy conservation, in the creation of the working regime and calculation method of the syphon water lifter. In the general case, on can explain the law of conservation of energy for a fluid mass in *dV* volume with the following equation [1; 2; 3]:

$$d\mathrm{Э} = \int_{\omega} \overline{P}_n d\omega dl + \int_{V} \overline{F}\rho dV d\overline{l} + \int_{V} \rho g dV dt$$

There: $d\mathrm{Э}$ - change of the energy of the liver;

$\int_{\omega} \overline{P}_n d\omega dl$ - work of the surface forces; $\int_{V} \overline{F}\rho dv dl -$ work of mass forces; $\int_{V} \rho g dV dt -$ reduction of energy by internal forces; dl - movement destination of liquid.

On can come to the comfortable equations which widely uses hydraulics for finding parameter of syphon water lifter with using only mass forces, the pressure and frictional forces of the one-dimensional steady movement mass forces from the above equation [1; 2,3,4; 6]. For this purpose, we accept the following expressions, ie, for the optional elementary flow, the elementary discharge equal to $dQ = u \cdot d\omega$ and because of the flow consists of many elementary flows sum of the elementary discharge, ie, whole discharge of flow is written in integral form [1;2]:

$$Q = \int_{\omega} u \cdot d\omega, \qquad (1)$$

There: ω – movement section; $d\omega$ – surface of the elementary flow of the motion.

Average speed ϑ is as follows:

$$\vartheta = \frac{Q}{\omega} = \frac{\int_{\omega} u d\omega}{\omega}. \qquad (2)$$

After certain mathematical modifications, on can add the following expression to determine water discharge for transmit water from 1-1 to 2-2 in the given scheme (Figure 3):

$$Q = \mu\omega\sqrt{2gH}\,, \qquad (3)$$

There: H – comparing pressure, it can calculate with following equation for given scheme:

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$$H = \frac{P_v}{\gamma} - H_2,$$

H_2 – geometric height;
$\frac{P_v}{\gamma}$ – vacuum in the container;
μ - is the coefficient of the, defines follow:

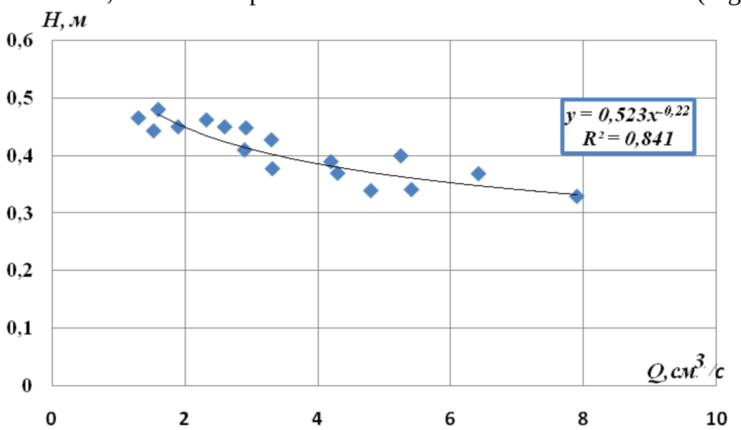
$$\mu = \frac{1}{\sqrt{\xi_{cuc}}};$$

ξ_{cuc} - the system resistance coefficient, that is, for the chosen calculation scheme, their values are determined in experiments or taken from special literature [1,2,3].

Laboratory experiments were provided to determine the specific characteristics of the device. The experimental data was analyzed using mathematical statistics (correlation coefficient was 0.87). Based on the analysis, the following equation was proposed for the relationship between discharge and pressure:

$$H = 0{,}523 Q^{-0{,}22}$$

Based on the obtained results, constructed pressure characteristics of the water lifter (Figure 4).



Picture 4. The pressure characteristics of the water lifter with syphon

III. CONCLUSION

Based on the theoretical and experimental researches, improved the parameters of the siphon water lifter and developed its calculation method. According to the improved parameters and developed calculation method modernized siphon water lifter device for using in practice. The convenience of the device that it does not require additional energy to operate. The water lifting process comes from the kinetic energy of the stream. The construction of the device is simple and can be created in laboratory conditions.

REFERENCES

1.Latipov K.Sh., Arifjanov A. Hydraulics and hydraulic machines. Tashkent 2008. -254 p.
2.Girgidov A.D. Technique mechanics of liquids and gas. Manual for Higer educations. SPb .: SPbGTU, 1999. 395p.
3.Chenson H. The Hydraulics of Open Channel Flows (Butterworth-Heineann: Oxford, UK), 1999. -302p.
4.Mirzajanov Q., Abduraimova D. Future of improvement of water supply and lifting constructions in European science review. Austria, Vienna, 2017. Pp-336-341. (05.00.00.00)
5.Arifjanov A., Duskulova N., Abduraimova D. Hydraulic of water lifter "Agro Ilm" journal,. 1 (17), 2011. T. 50-51 p.
6. Abduraimova D., Duskulova N. Resource saving water lifters with small pressure. Tashkent. Collection of scientific works SANIIRI, 2010, 128-130 p.