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STUDY OF THE INFLUNCING FACTORS TO THE WATER WELL CAPACITY

Abstract*: In Uzbekistan and other Central Asian countries mostly use ground waters and researches related to solve their problem show how they are urgent. It requests a sustainable management and rational using of ground waters. This article devoted to the increasing of the efficiency of water well which is the first part of the water supply system. Also sustainable water resources management is the main goal of the researches and investigations.*

Key words*: well, water supply, water intake, filter, lowering the static water level, productivity, pipeline.*

Language*: English*

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Introduction

In the course of consistent and large-scale reforms in all sectors of the economy, much attention is paid to the water supply of the population and production, as well as to the sustainable use of available water resources. Naturally, increasing demand for water complicates the capacity of water supply systems, their technical improvement and their management. As a result of the growing demand for underground water intake facilities, they are faced with new, modern, reliable and stable operational requirements. Sustainability conditions also increase consumer water demand and process reliability.

The Dakhbet water intake facility we are considering is a water production complex of water intake facilities serving the Samarkand city water supply system, which contains 30 medium-sized artesian wells. Dakhbet water intake facilities are located on the left bank of the Zarafshan river and in 4 zones on both sides of the Big Uzbek Highway. For many years, the wear of salts and corrosive elements on well filters and inlet channels leads to their depletion, which leads to failures in the water supply system.

Dakhbet water intake facilities provide about 30% of Samarkand city consumers with clean drinking water. Basically, this facility will provide the Octyabrskaya and Gormolplant water stations with drinking water in the area of the city's railway station, part of Microdistricts A and B, as well as in Sogdiana. Of the 30 artesian wells available at the water body, 23 are in working condition, 3 are in reserve and 4 are under repair[1]. There are two indoor pools for storing water, a secondary lift pump station, a chlorination station and an administration building. This installation has a capacity of the water well as 153 cubic meters per hour and a total capacity of the station is 3519 m^3 of water per hour[2]. The problem of reducing production rate in unproductive or inefficient wells was identified, and below we will analyze the main causes of this condition.

Analysis of the main reasons for the decline in well productivity.

Well wear is analyzed to reduce their level and decrease specific production rate. This requires hydraulic calculations of the well for the initial and postoperative periods. The main purpose of the hydraulic calculation of wells:

• determination of well flow rate;

• detection of a decrease in the static water table in the well during operation;

• determine the interaction between wells operating in the same layer.

A limited decrease in the static water level in the well - S_l, the water consumption set by the project, that is, the amount of water consumed by the consumer depends on QT. In the calculations, the initial values of $S_ч$ can be found using the following expressions[3]:

a) For injection wells:

$$S_l \approx -(0{,}3\ldots0{,}5)m + H - H_H - \Delta H_f, м \quad \textbf{(1)}$$

where: H - water pressure in the layers, m;

$H_н$ - distance from the dynamic water level to the lowest point of the pump, m;

ΔH_f - is the pressure loss of the water flowing through the layer, and its value is determined by the resistance of the filter and surrounding rocks to the flow.

m - is the thickness of the water supply layer, m;

Hydraulic calculation of wells is recommended using the following images (Figure 1). 1 - filter; 2 - pump electric motor; 3 - pump shell; 4 - well walls; 5 - water-transmitting pipeline; 6 - pipeline route; 7 - static layer; 8 - dynamic layer; A is the length of the engine; B - pump size; B is the distance from the top of the pump to ground layer level.

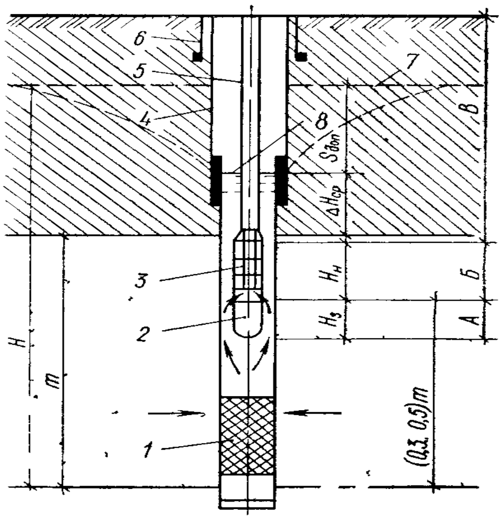

Figure 1. The design scheme of artesian wells.

Well production is determined based on the main characteristics of the aquifer and the details of the well. The water supply layer is under pressure, and the movement of water in the layer is stable[4]. If the influence of external factors affects the distribution of the wells, it is advisable to study them separately and determine their share in reducing production. When determining the water capacity of artesian wells, it is necessary to take into account the above parameters and their special effects. Now consider a specific case of well production.

Water flow in an artesian well operating in a stable layer of water movement is determined by the expression Dupuis[5]:

for these layers:

$$Q = \frac{2.73 \cdot k \cdot m \cdot s}{lg\frac{R}{r}}, м^3/d. \quad \textbf{(2)}$$

where: k - is the volatile rock that forms the aquifer coefficient, m / day;

m - is the thickness of the water layer, m;

s - reduction of the static water level in the well, m;

r - is the radius of the well, m;

R - the influencing radius of the well, m;

$$R = 10 \cdot S \cdot \sqrt{k}, м \quad \textbf{(3)}$$

It will also increase water demand in the coming years, improve preparation technology, use the latest information technologies for monitoring wells, modern water pumps, filters and changes in groundwater flow rates, and also improve the relationship between the consumer and the water supply system, water-saving incentives and changes in water tariffs in relation to other resources[6].

Based on the foregoing data, the authors analyzed the location of the wells, the distance between them, as well as the details of the water supply layer, which are the main structures in the complex of Dakhbet water intake facilities. When the results were fully investigated, the following problems were identified[7]:

- there is no coincidence between the pumps in the well and its capacity, which is associated with the combined effect of external and internal factors, which leads to a decrease in flow rate;
- water inflow to the well is sharply reduced due to filters installed on the well and separately formed filter zones, which leads to unexpected failure of the design pumps;
- failure to supply the wells with necessary well pumps will be replaced by unsuitable pumps as necessary, which will lead to an imbalance between the flow rate of wells and water intake, which will lead to a decrease in well efficiency;
- it was found that due to the long-term operation of the wells, their filter and filtration coefficient decreased due to mudding in the gravel layer, which led to an imbalance between the actual well production and pumping capacity of the pump;
- increased demand for water in the city of Samarkand, led to a significant decrease in the efficiency of their use due to excessive demand for wells and the imbalance between water supply and urban water supply;
- a decrease in the daily influx of fresh water into the reservoir due to a decrease in the flow rate and degradation of the wells, which led to a violation of the water supply schedule;
- the inability to differentiate the pressure difference in the network connecting the wells and the water supply to the RVS, led to the fact that they interact with pressure, the actual amount of water will be lower than predicted.

Due to the mentioned problems, the share of Dakhbet facilities in the water supply of Samarkand city has decreased. As a result, interruptions in the city's water supply schedule occurred and water consumption and pressure decreased.

In this article, we explored solutions to the aforementioned problems and measures to prevent their occurrence in the next step. Each problematic situation is analyzed separately, and their solutions are determined by their importance, and the overall economic effect is calculated by helping to increase the efficiency of water use. The measures will be based on the principals of sustainable development, which will satisfy the growing water demand of consumers due to future water shortages. Below is a real picture of one of these problems as a result of remote video analysis of artesian wells.

Figure 2. The process of clogging in the filter section of the inlet water well is shown.

After the well is fully diagnosed and its results are analyzed, and the problem is identified, we will begin to choose ways to solve these problems, that is, the restoration of the well.

Development of proposals for the restoration of well performance. The regeneration of water wells, methods for their extraction and the technology for their implementation should be developed on a scientifically sound and advanced basis. The main goal of well filter restoration is to eliminate collagen (salt, sand and metal rust), which consists of salt and other debris drowning in filters and filter waterways to reduce additional resistance to groundwater flow. A feature of this process is that it is more difficult to clean deposits on the outer surface of the filter and in the pore space of the filter region. This is achieved by defrosting or crushing them with various pulses, as well as removing them using hydraulic plates. When crushing solid sediments, it must be ensured that the particle size is smaller than the pore space in which water moves. The efficiency of the wells and the filtration fields may vary depending on the method.

Next, we will review the methods for restoring the flow of groundwater into the well.

In the process of well restoration, depending on their filters and the effect on the filter area, they can be divided into reagent, impulsive and combined impulsive reagent methods[8]. Classification of the methods as the first group, namely, reagent methods, are based on the dissolution of the colmatant with various reagents, which led to a decrease in the well's efficiency. Methods of regeneration are to choose the type of reagent depending on the details of the well, its filters and other equipment, as well as determine the parameters that ensure the efficiency of the process. These parameters include the concentration of the reagent, indicating its acidic or alkaline pH, treatment time and temperature to prevent corrosion of the metal reinforcement. It is also important to monitor the process of the well and the timing of its completion.

Various reagents are used to treat wells and rehydrate the well using a reagent. These include neutralizing, reversing, and complex reagents. It is based on the purification of waterways of wells by dissolving reagent sediments. The complexity of this method is to select a reagent separately for each well and determine the concentration of the reagent used.

Reagents are selected mainly due to the chemical, mineralogical composition of wells and filtration deposits. In addition, it should be borne in mind that sedimentary reagent also acts on wells, walls and rocks that form an aquifer, reducing their strength. To prevent this, special corrosion inhibitors are added (a special additive used to reduce the corrosive effects of the reagent), but this method is not always feasible, because, firstly, it affects the chemical processes in the well, and secondly, at any cost reagents.

Summary suggestions. An analysis of existing water well designed, constructed and used to date has shown that they do not pay much attention to earthquake resistance and longevity and do not provide natural and effective performance. For example, one of the tasks that must be completed to ensure the uninterrupted supply of drinking water to Samarkand is to drill 10 additional new wells in Dakhbet and provide 250 m^3 of water per hour[9]. This requires additional costs. This means that it is necessary to work on projects that are completely based on regulatory documents for the natural conditions of the region. Groundwater quality is essential for well operation. In most cases, the deterioration of water quality in an existing well indicates that the sanitary dehydration zone does not meet the requirements.

The authors of this article propose to rehabilitate absolute debit of wells and restore their effectiveness. Since this article does not provide a detailed overview of the full cost-effectiveness and environmental benefits of the proposal, the following article will provide these recommendations. At the National Center UZWATER at the Department of Water Supply, Waste Water and Water Resources Protection, the Samarkand State Institute of Architecture and Civil Engineering conducts researches on modern technologies and their application in the direction and comprehensive project "Sustainable Water Resources Management"[10]. Given the importance of groundwater and its importance in the Central Asian region, work in this area is devoted to improving the efficiency of artesian wells. This, in turn, will significantly increase the efficiency of capital investments for water supply facilities.

References:

1. Soatov, U.A., Gadayev, A.N., & Boboyeva, G.S. (2006). *«Vodozaborniye soorujeniya»*. Samarkand.
2. Riden, L., & Akin'shina, N. (2016). *Upravleniye i ustoychivoye ispol'zovaniye prirodnykh resursov*. Tashkent.
3. Neskoromnix, V.V. (2014). *Bureniye skvajin*. Uchebnoye posobiye. (p.400). Krasnoyarsk: Sibirskiy federalniy universitet.
4. Boyarko, Yu.L., & Samoxvalov, M.A. (2012). Uchebnaya burovaya praktika. Uchebnoye posobiye. (p.116). Tomsk: Izd-vo Tomskogo politexnicheskogo universiteta.
5. (2012). Disaster by Design: Aral Sea Sustainability and its lessons. Prof. Michael Edelstein, Astrid Cyerny, Abror Gadaev, UK, London.
6. Belitskiy, A.S., & Dubrovskiy, V.V. (1974). *Proyektirovaniye razvedochno-ekspluatatsionnix skvajin dlya vodosnabjeniya*. (p.256). Moscow: Nedra.
7. Gadayev, A.N., Ganiyeva, D.U., & Kholikulov, S.K. (2015). *Analiz artezianskikh skvajin v vodozabornykh sooruzheniyakh Dakhbeta*. Nukus.
8. Rangwala, I., & Miller, J.R. (n.d.). *Climate change in mountains: a review of elevation-dependent warming and its possible causes*.
9. (n.d.). Retrieved 2019, from www.uzwater.ktu.lt
10. (n.d.). Retrieved 2019, from www.unep.org