THE WATER WELL CAPACITY REHABILITATION BY USING ORGANOPHOSPORIC COMPLEXONES

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ABSTRACT

In Uzbekistan including other Central Asian (CA) countries the most urgent issue is the water resources sustainable management. The global ecological problem as the Aral Sea disaster makes it more urgent not only for one nation but also for the all CA region. As it is known, that the process of society development is almost impossible without negative influence upon the nature and such influence leads to change in natural balance. There are environmentally safe and enough by hydrologically balance of the ground water resources in the region. Increasing the number of the population and industrial enterprises as consumers leads to an increase in their demand for water and, accordingly, the number, capacity and costs of water wells increase. In order to supply water to consumers, in most cases, additional wells are built, the cost of which is much higher than prolongation of the old ones. This article is devoted to the water well rehabilitation by using complex acids as the organophosphoric complexsones. Operation of the water wells in the condition of poor groundwater quality, in high water rigidity is a result of the salt depositions, filter corrosion producs in the pores and on the surface of the water well filters as well as near filter zone. It leads to decreasing in the productivity of wells. At the UZWATER ceter of SamDAQU studied the clogging deposits as the chemically and mineralogically multicomponent comlex composition colmatant. Which is the main reason for reducing a productivity of the water wells. Also developed effective method by using complex reagents as organophosphoric complexones and carbon dioxide which will help to removal of the clogging deposits and a stable work of the water wells.

Keywords: water wells, debit, filters, colmatant, reagents, rehabilitation.

Uzbekistan and other Central Asian countries including Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan and Afghanistan are struggling to come to terms with an ecological disaster affecting the Aral Sea. The crisis has been brought about by the mismanagement of water resources from the Aral's main tributaries, the Amudarya and the Sirdarya rivers. The primary source of quality drinking water in Uzbekistan and Central Asia is ground water, which accounts for between 85 an 90 % of the general water budget. Agricultural irrigation systems have caused high pollutions levels in the region's (unevenly distributed) surface waters. Historically water flow the Aral Sea was 56 km3 per year, which decreased to 47 km3 between 1966 and 1970. Water flow plummeted to 2 km3 between 1981 and 1983, and now stands at less than 1,8 km3 . A key question is how to balance social and economic development with natural resource protection. Central Asian Republics utilize the same watersheds and share many water management issues in common. It is clear that the region's existing multination and regional water management and environmental protection project are insufficient by themselves to meet the scale of the problem. Further multinational agreements and joint-state/joint-agency programs will undoubtedly

be required. The Central Asian region has been designated in recent years as an ecological and social disaster zone because of Aral Sea situation. Although water resources are not a new issue, this problem can be traced back to the beginning of civilization for a number of reasons. The beginning of irrigated agriculture in the region dates back to the 6th-7th centuries B.C. This time period coincides with a flourishing of the most ancient civilization where irrigation was a major decisive factor of historical and socio-economic development. Today the Aral Sea and surrounding territories are world-known for ecological disasters attributed mainly to anthropogenesis factors. In recent years, Uzbekistan's control under multiple regimes and governments has made it difficult for central Asia to unite. The growth in water consumption is connected to cultivation of new irrigated territories, where mainly cotton and rice are grown. That issue combined with the increase in the population and employment in agriculture, the flow of water to the sea from the two major river systems -the Amu 310 Darya and Syr Darya - completely stopped. By the beginning of the 20th century, 7-8 million people lived in the region. Irrigated lands made up about 3.5 million hectares and had irrigation networks of different levels. It was the foundation of society's economic base. At present the population of the region has increased 7 times, exceeding 50 million people. In response to the increase in population, irrigated lands have doubled (7.5-7.9 million hectares). In the climate of the Aral Sea region, 60 cubic km per year would be needed to keep the surface. Area of the Aral Sea at approximately 60 000 square km. The water has stopped completely. From 1930 to 1960 there has been a sharp increase in water usage from 25 km3 to 103 km3 a year. The quantitative facts alone show the high usage rates for improper reasons coupled with less potable water for health incentives. The improper use of the water taken from the Aral Sea has led to many consequences that the interstate commission is trying to resolve. Unfortunately since the departure of the USSR, central Asian economies have not been strong enough to rehabilitate the productivity of the territory. Large and ominous hardships fall onto the responsibility of the government. Socially these include protecting the population from adverse impacts of desertification, creating new workplaces and job markets and trying to improve the economic and social conditions by introducing new water efficient technology. Ecologically, each country must implement new plans for the restoration of flora and fauna diversity and the prevention of any further degradation of the Aral Sea. In particular, improving irrigation efficiency, water supply development, waste water treatment and watershed management are critical needs throughout Uzbekistan and Central Asia. An ecological disaster was set in motion in this region beginning in the 1950s, when water was diverted from the two rivers that flow into the Aral Sea. An additional problem is the regular failure of the region's groundwater systems during the summer (when the demand sharply increases), so that the population is left to consume poor quality surface water. In particular, improving irrigation efficiency, water supply development, waste water treatment and watershed management are critical needs throughout

Central Asian countries are recognizing the importance of the ground water resources management issue and signed an agreement on joint management of the regional water resources. Establishing the Aral Safe Foundation one of the examples for sustaining development and managing natural resources in the region and it was agreed by the all newly established independent countries. Using ground waters and prolongation of water wells' life time is one of the proper way to decreasing water intake from the main rivers of CA and save more water for the Aral Sea. This article devoted to the new method of water well rehabilitation and prolongation of their life time. The main question is how to sustain of the water supply system functioning and water saving technologies as well as the water resources management. This is very complicated where regions feel sharp climate change as a global and regional aspects. In particular, improving water supply system efficiency, safe and an effective water supply development, waste water treatment and reusing, watershed management and others are critical needs throughout Uzbekistan and Central Asian (CA) region. This is a big question in the Uzbekistan and Central Asian region because of the Aral Sea ecological disaster caused by water resources mismanagement. It is known, a global climate change is accelerating a glacial and snow melting and shortening the main source for the Amu Darya and Sir Darya through the mountains. An ecological disaster was set in motion in this region beginning in the 1950s, when water was diverted from the two rivers that flow into the Aral Sea but it was with the condition of obvious returning the Siberian rivers towards the Aral Sea. For various reasons this project was stopped but water intake from Amu Darya and Sir Darya was continued to grow cotton and other agricultural crops in the territory of CA. Now is almost 30 years as Soviet Union collapsed and all CA Republics became independent as a new state. The political, geographical and ecological

situations are changed but water deficit and Aral Sea problem is still continuing and getting worst. Today we need some new approaches to the water problem solving in this region and one of them is sustainable water management by using innovative technologies which allows saving more water in the rivers. In this article we offer one of them as an alternative approach to safe surface water in the Sir Darya and Amu Darya by using ground water technologies. Particularly, we offer developed new water well rehabilitation method for a CA regions' conditions. This alternative method allows prolongation a life time of the existing water wells by rehabilitation their capacity. Water wells' operating practice shows that if a well has lost more than 25% of its original capacity rate for some or another reasons, regeneration is expedient. One of the main reasons for reduction of well flow rate is a clogging (colmatation) of the filter and near filter zone by salt deposits and corrosion products. For a well inspection CCTV method was used. (Figure 1.)

FIGURE 1. Filter porous clogged by salt and metal corrosion products (Photo is taken by Abror Gadaev during the CCTV inspection of the water well filters)

Since, clogging of the filters' porous is a multi-factor and complex physical-chemical and hydro geological processes, the concretization of the main factors will allow to correctly determining the method of recovery of well productivity. Methods for the well flow recovery should facilitate removal of clogging deposits from the filter outer surface and from the filter zone. During mechanical treatment of filters (cleaning with metal spars, scraper devices, swabbing, etc.) clogging deposits are broken only from filters and working columns. Treatment of wells by using reagent methods allows removal of salt deposits from the filter surface and at the filter zone. However, these methods do not always guarantee the desired effect, since the permeability of the reactant solutions are negligible in the salts clogging of the filters and in the near filter zone with dense precipitates. Using of impulsive methods can be effective only at the initial point in time of operation. At the same time, sediments are destroyed and dispersed, and complete removal of them during washing is impossible. Residual amount of salt deposits intensifies the process of repeated colimitation process. In addition, the application of this method is limited by the strength characteristics of the well elements (filters). Application of combined methods provides higher effect of well production recovery. In this case, the combination of impulsive and vibration techniques with reactant compensates for the disadvantages. As a result, removal of clogging deposits from the filter surface and near filter zones is improved. However, the use of the above-mentioned methods of recovery of the working elements of water intake structures fails to achieve the desired result due to complications arising in the recovery of well productivity, as each method is applicable in certain hydro geological conditions. In this regard, research on new efficient methods of cleaning filters and near well filter space from sediments, improvement of existing methods and technical equipment for unclogging and ensuring stable operation of water wells are urgently needed. One of the promising method of cleaning filters and near filter zone from salt deposits, corrosion products and biological fouling is the method by using complex reagents and solid carbon dioxide. In the practice of recovery of water wells high effect of filter cleaning

and sub filter zones is achieved at cyclic pressing of reagent solutions beyond the well contour. Compressed air or solid carbon dioxide is used to press solutions of reagents into the formation.

RESEARCH AND RESULTS

In this regard, we consider it useful to investigate the possibility of using complex reagents of selective action (RSA) to restore the yield of water wells. As an agent for pressing the solution of RSA behind the contours of the well filter in order to ensure cleaning of external walls of the filter and near filter space from clogging formations and corrosion products, it is proposed to use solid carbon dioxide. Complex studies of clogging deposits were carried out as a result chemical and mineralogical compositions were installed. (Figure 2.) Clogging well deposits consisted mainly of salts and oxides of two and three valent metals (mainly Ca, Mg, Fe etc.). Reagents for their removal are selected on the basis of obtained results on deposit compositions. As reagents there were proposed complex reagents of selective action (RSA) NTP and OEDP in the some of proportion. The choice of these RSA as complex reagents is justified by taking into account their selective effect on metals contained in the clogging composition. Laboratory experiments carried out on the main factors affecting the effect of dissolution of the clogging deposition such as concentration, temperature of the solution and duration of treatment time, allowed to establish their optimal values. The adequacy of the main factors and the significance of the main hypothesis were tested by the method of planning the experiment. Corrosion activity of the proposed solution with respect to metal elements of the well is investigated in the UZWATER National Center at the “Water supply, Sewerage and Water Resources Protection” Department of Samarkand State architectural and civil engineering institute Presented research results on ground water resources sustainable management, especially on water well rehabilitation issues in the regions with dry and hot climate condition.

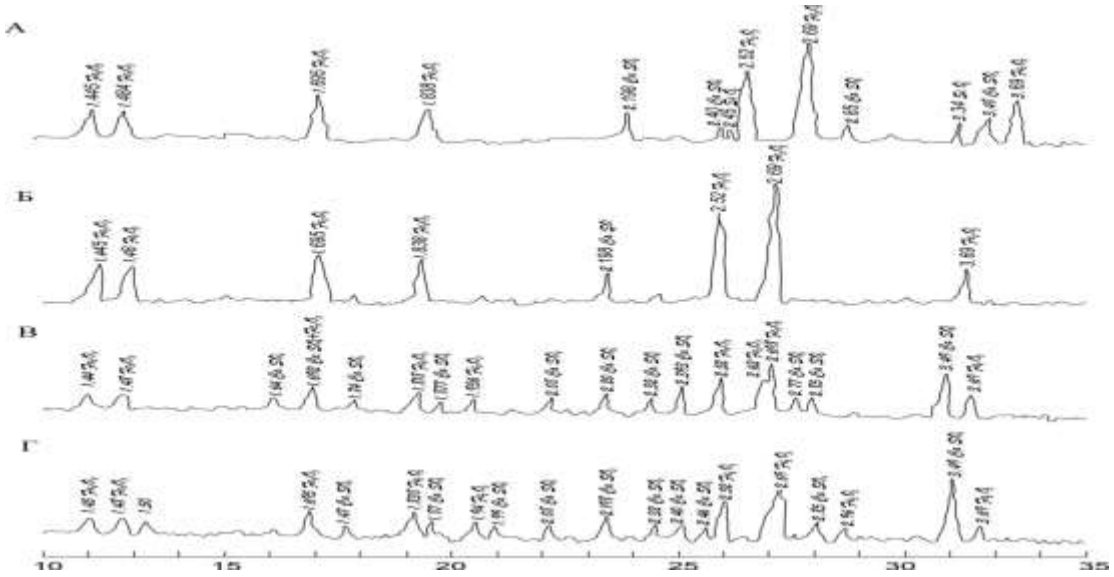

FIGURE 2. Research of the chemical composition and diffraction patterns of clogging deposits. The water well rehabilitation technology with application of selective action RSA reagents and solid carbon dioxide in production conditions is offered and collaboration research with USA partners on this issue in dry and hot climate conditions is continuing.

CONCLUSIONS

1. Central Asian and Uzbekistan’s water supply system is using mainly the ground waters because of the water resources limitation and Aral Sea ecological disaster;
2. Improving the situation in the region is possible by increasing water resources management efficiency with the main focus on ground waters. This option is more realistic by ground waters using and by prolongation of water wells’ life time because well operation and their stable debit and standard life time doesn’t meet official standards.