

THE WATER WELL CLOGGING AND REHABILITATION ISSUES

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Water is one of the most important components of environment and its resources are limited. Especially safe and clean water resources are already in deficit. It's known, that Central Asia is an agricultural region and has only two rivers as a surface water resources, however ground waters are enough protected and their resources can be one of ecologically safe source for drinking, industrial and municipal needs. Water wells are the important part of the water supply system. Loosing of productivity, clogging of the filters and the gravel zone issues are common in Uzbekistan and other Central Asian countries. This article is about water well rehabilitation and some new methods and devices for cleaning filter screens and near filter (gravel) zone.

Key words: ground waters, water wells, filters, specific and decreased yield, clogging deposits, rehabilitation method.

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ПРОБЛЕМА КОЛЬМАТАЦІЇ ТА ВІДНОВЛЕННЯ ВОДОЗАБІРНИХ СВЕРДЛОВИН

Вода – один з найважливіших компонентів навколишнього середовища і її ресурси обмежені, особливо дефіцитними стали ресурси безпечної та чистої води. Відомо, що Центральна Азія є сільськогосподарським регіоном і має лише дві річки як джерело поверхневої води, однак є достатньо захищені підземні води, які можуть слугувати екологічно безпечним джерелом питного, виробничого та муніципального водозабезпечення. Свердловини є першою та найважливішою частиною системи водозабезпечення. Зниження їх продуктивності, кольматація фільтрів і прифільтрової зони є розповсюдженою проблемою в Узбекистані та інших центрально-азіатських державах. Дана стаття присвячена обробці та відновленню свердловин, а також деяким новим методам обробки та пристроям для очистки фільтрів та прифільтрової (гравійної) зони свердловин.

Ключові слова: підземні води, водозабірні свердловини, фільтри, питома та знижена продуктивність, кольматційні речовини, спосіб відновлення.

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ПРОБЛЕМА КОЛЬМАТАЦИИ И ВОССТАНОВЛЕНИЯ ВОДОЗАБОРНЫХ СКВАЖИН

Вода – один из важнейших компонентов окружающей среды и её ресурсы ограничены, особенно ресурсы безопасной и чистой воды, которая стала дефицитом. Известно, что Центральная Азия является сельскохозяйственным регионом и имеет только двух рек как источник поверхностной воды однако, имеются достаточно защищенные подземные воды и они могут служить экологически безопасным источником питьевого, производственного и муниципального водоснабжения. Скважины являются первой и самой важной частью системы водоснабжения. Снижение их производительности, кольматация фильтров и прифилтровой зоны являются распространенной проблемой в Узбекистане и других Центрально Азиатских государствах. Данная статья посвящена на обработку и восстановление производительности скважин и некоторых новых методов обработки и устройств для очистки фильтров и прифилтровой (гравийной) зоны скважин.

Ключевые слова: подземные воды, водозаборные скважины, фильтры, удельная и сниженная производительность, кольматационные вещества, способ восстановления.

This article will address the need for water resource management in Central Asia with a focus on Uzbekistan. The normal vital activity of population is directly related to their stable drinking water supply. As it is known the process of society development is impossible without influence upon nature and such influence leads to change in natural balance. Solution of the problem of society development is becoming more urgent

influence of improvement of social condition of population and preservation the environment. It requests modernization of water supply system, its technologies and devices. The first and very important part of the water supply system is water intake stations and lifting equipments such as water wells and it's screen. This article is about water wells issues in Central Asia and particularly in Uzbekistan where ground waters are the primary source of quality drinking water. It represents 85-90% of the general water budget. There are territories and regions where ground water is the only source. Uzbekistan is a region with a very hot and dry climate. During the long summer (from May until October) water consumption increases sharply and wells with declining productivity cannot meet the demand. Existence of a water supply source, constructions for getting and lifting water to the consumers is not always sufficient. This brings about necessity of the better founded approach to operation structure to rational use of water resources. However, some of these wells are not in a good and operable condition. It is very common for a well to have years of operation prior to experiencing loss of capacity. With age it is common to see these lost capacity problems frequently. The increased frequency of lost capacity and the need for well rehabilitation treatments is due to the incomplete removal of plugging deposits from prior rehabilitation efforts, thereby not maintaining the original pore volume of the gravel pack, well screen, or fractured formation. There are lots of deficiencies in the well pumping system ranging from the wells themselves to the equipment and switchgear installed.

Over time, it is very common for water wells to experience lost capacity as well as a variety of water quality problems requiring some form of well rehabilitation. It is common in the Aral Sea disaster zone where the quality of the ground waters and environmental conditions are worse in terms of safety. Most of these problems are a result of fouling material becoming deposited on the surfaces (rock surfaces, gravel pack, well screen) in water environments.

Effective water well rehabilitation requires the removal of all deposited material thereby allowing the specific capacity and pore volume to be restored. There are many different strategies and methods used in water well rehabilitation, some successful, others less successful. The success in using many of the physical and chemical methods is dependant on the user being able to fully identify the plugging material, or combination of plugging material and design a specific chemical treatment to dissolve that material. This becomes a daunting task due to the variability of the complex geochemical and microbiological underground environment and the reliance of the user to perfectly design a specific chemical combination required to fully remove the plugging, while not effecting well construction.

As it mentioned, 93% of drinking waters in Uzbekistan come from the aquifers and the quality commonly doesn't meet the standards. Mainly they are hard and mineralized by salts calcium, iron and magnesium.

The main reason for ineffective operation of wells is clogging of filters and filter area by salt deposits and corrosion products of metallic elements. The clogging deposits consists mainly salts calcium and iron oxides. When wells lost more than 40 % productivity they need to be rehabilitated (restoring as a cleaning up filters and gravel zone). This situation requests groundwater use management by improving efficiency existing water wells. From the economical and ecological points of view the regular water supply of the population should be based on the active structures of a system of water supply as there is a considerable potential of increasing the efficiency of use of investments which they can provide.

The new water well rehabilitation technology called combined uses solid, gaseous and liquid carbon dioxide with composition of complex acid to restore water wells. Since 1991, the offered technology has been used on more than two-hundred wells in Ukraine and Uzbekistan with excellent results. A combined water well rehabilitation technology has been used on a wide variety of wells including vertical wells, drainage wells, from shallow to very deep wells, from small diameter to large diameter, screened and injection wells. Offered well restoration method is more effective at removing deposits from both inside the well screen and the formation surrounding the well because the process is impulsive and

cyclic. One of the active components from the injected gas is carbonic acid, a mild acid, which under atmospheric conditions produces a pH of +/-6.0. However, there is pressure in an aquifer or a sealed well, allowing the pH values to become reduced to as low as 4.0. and more, still relatively mild. When the pressure is released the pH will return above pH 6.0 and therefore does not become a neutralization or disposal concern. There is also the effect of localized space in the well and and more importantly, agitation, as the liquid carbon dioxide is injected at approximately 0°F. The process is not an overly aggressive process, yet is capable of delivering the necessary energy required to be effective in wells constructed using PVC or HDPE wells, without problems. The success is achieved through combination of carbonic acid, agitation, and localized space resulting in superior disruption and detachment of the encrusted and plugging material. The bulk of the activity is due to phase changes. The expansion rate from a liquid to a gaseous state of the carbon dioxide is almost 700 times in volume. The agitation achieved with liquid carbon dioxide is the same action as when dry ice is placed in water by using a special container. There is agitation as the carbon dioxide changes, in this case, from a solid to a gaseous state. The process is the controlled injection of carbon dioxide, as injection pressure and down-hole pressure are monitored to regulate the feed rate the well will comfortably accept. The rate and volume of carbon dioxide injected is regulated to assure that the pressures (and energy) going down the well can dissipate into the surrounding formations. A new and more compact container allows to introduce chemicals and solid ice to the localized space in the well near filter area. Gaseous and liquid carbon dioxide contain tremendous energy, described as energy of dissolution, energy of detachment and energy of agitation. This energy results in the detachment, dissolution and removal of sediments and encrustation from the surfaces within the well screen and the surrounding aquifer.

The combined well rehabilitation method by using a new designed chemical complex and device are relatively broad ranging in its ability to effectively disrupt and remove a wide variety of plugging deposits, in a wide variety of well construction types and materials, offering superior deposit removal and more complete pore volume recovery, without adversely effecting well construction.

All wells are in different state in their performance and use. The further utilization of some of the wells might be critical for various reasons, such as physical condition of the well, existing pollution or potential pollution of the water catchments area, risk for contamination, etc.

Using the new developed water well rehabilitation technology increasing of productivity of the water well achieved 90 % of original capacity.

The economic benefit of processing one well is \$13500 US. The developed method is combined (blended) for water well rehabilitation by using complexions as chemicals and solid dioxide carbonic as an agent for pressing of the selective solvent into filter area and helps make a process as cyclic. The combined rehabilitation method can fully restore the water well capacity and economic value is equal 15-20% from overall value of construction of new wells.

Надійшла до редколегії 08.12.10