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(<http://aquaexpert.ru/news/2008/05/20/edinoros/>).

Solving the problem of providing the population with high quality drinking water and disinfectant solutions: analysis and perspective

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Basically, all over the world, wars arise over energy sources. According to experts, this problem has two aspects - access to oil sources and to drinking water. Oil is the main source of energy for mechanical systems, water is for biological systems. None of the reasonable consumers have any questions or attempts to use low-quality fuel at a low cost instead of high-quality fuel for their car (~ 2 ... 4 liters per day, ~ 23 ... 28 rubles / liter). But, for myself, the use of low-quality "drinking water" (~ 2 ... 4 l / day) at a cost of 2 ... 8 rubles / l. and less long ago it became the norm. The consequences for society and individuals are well known. A similar critical problem has ripened with the provision of the population with disinfecting, sterilizing and cleaning solutions of the highest quality.

Currently, there are numerous norms, rules and approaches to determining the quality of drinking water. The basis for the quality of drinking water is its purity and mineral composition. But, as it turned out, even chemically pure water is a liquid with an extremely complex structure and properties [1-21]. When developing the standards for drinking water, the main thing was not taken into account and the child was thrown out - the biological usefulness of water. Therefore, the water in our homes is still not potable.

The long-term state program "[Clean Water](#)" envisages the division of tap water into technical and drinking water. "We propose to consider the following options: water is disinfected using existing technologies, and then each entrance of the house has its own filter, which brings the quality of water to drinking water and supplies it to the apartment. Thus, the apartment should have two taps - with industrial water and with drinking water," - said Gryzlov, chairman of the State Duma, chairman of the Supreme Council of the «United Russia» party.

In recent decades, the interest of scientists all over the world in the famous, but, at the same time, amazing substance called "water" is constantly growing. The results of numerous studies have shown that the existing standards for assessing the quality and research of water properties are imperfect and do not take into account many parameters that characterize its biological usefulness and activity. The physiological properties of water are influenced not only by its chemical composition and degree of purification, but also by a number of other complex physical parameters that characterize water as a complex structured system that is in a nonequilibrium thermodynamic state with its own characteristic radiation and its own microcluster structure.

Water activation (its transfer to a nonequilibrium thermodynamic state with a resonant microcluster

structure) can be carried out by various physical, chemical or biological methods.

One of the most important parameters of drinking water is its "charge" - the redox potential (ORP). The ORP of drinking water, measured with respect to the silver chloride electrode, should be negative, and the pH should be neutral, because human cells have an ORP $\sim (-70)$ mV. Diseases occur when the negative potential of cells (ORP) differs from the norm. As studies have shown (applications for invention 2007127132 RF, 2007127133 RF; Pat. 2299859 RF, 2316374 RF) for environments transferred to a nonequilibrium state, ORP is an integral indicator reflecting the structure and biological activity of drinking water, and can be different, even with one and the same pH [2, 3].

Ordinary drinking ("canned") water with an $ORP > 0$, penetrating into the tissues of the human body, takes away electrons from cells and tissues, which are 80-90% water. As a result, the biological structures of the body (cell membranes, cell organelles, nucleic acids, and others) undergo oxidative destruction. So the body wears out, ages, vital organs lose their function, immunity decreases.

Mountain melt water, negatively charged due to triboelectricity and structural phase transitions, has a microcluster structure. Drinking water with negative ORP is easily assimilated by the body, imparts its charge to the blood and is carried throughout the body, replenishing the negative charges lost in the course of illness. For example, it was found that watering mice irradiated with a lethal dose of X-rays with water with an $ORP = -450$ mV reduced mortality among them from 96% to 10% compared to the control group, which was given regular (non-activated) tap water with a positive ORP. As a rule, the negative ORP value of activated water lasts no more than a day, so it is advisable to prepare such water yourself, or to live near mountain springs with "living" water.

In 1990, B.I. Kiselev developed a method for obtaining activated aqueous solutions (ATS) on the basis of contactless action on water by a field - magnetic, laser and sound (USSR Pat. 1827274). He was the first to prove that artificially, using a physical method, it is possible to force an inanimate object (water) to become biologically active and useful for a limited time. Clinical studies have shown that ABP is the strongest immunostimulating and therapeutic-prophylactic agent without side effects. Compared to oral administration (~ 60 days), infusion of ABP is the fastest and most effective (~ 10 days).

In 2000, pills of "life" - microhydrin (nanocarbon) were invented. One tablet for a glass of water, milk, Coca-Cola changes its ORP from $+300$ mV to -300 mV, which is significantly higher than that of freshly made carrot juice (70) mV. Microhydrin is considered to be the strongest antioxidant, but, unfortunately, the cost of 1 liter of such water is quite high ~ 100 rubles.

Later, V.M. Dvornikov (Pat. 2234945 RF) developed the drink "Your Health", which retains its negative ORP for a long time $\sim 6 - 12$ months. Studies have shown that the drink has pronounced immunostimulating, therapeutic and prophylactic properties, but its cost is not affordable for many (~ 140 rubles / l).

An important parameter of drinking water is also its mineral composition. The lack of basic ions Ca^{++} , Mg^{++} , J , Se ... in water leads to a number of diseases. Only in some sources is the content of trace elements, ions within the limits of the norms recommended by the WHO (for example, water sources "Sarovo").

A low level of intake of calcium and magnesium ions in the body is the cause of hypertension, coronary heart disease, osteochondrosis (even in children of 1.5 years of age), osteoporosis (fragility of bones), poor posture, decreased intelligence and memory, increased stone formation of the biliary tract and urinary system, destruction of tooth enamel, hair loss, etc. Calcium and magnesium ions are essential for the normal development and functioning of the human body. Children, pregnant and lactating women, the elderly are especially in need of them.

The results of the studies have shown that there are only a few natural unique sources in the world with water of a certain composition and properties, allowing you to live a full healthy life. Typically, these springs are located in the mountains. What to do to the rest, who mainly drink "canned" water (tap or bottled)? Historically, there

were two directions in the preparation of drinking water.

The first direction - economical and massive - is based on the purification and disinfection of water from the nearest sources to the corresponding sanitary and epidemiological rules and norms for each country. This method of purification preserves the necessary minerals for consumers and ensures the cost of drinking water ~ 0.001-0.1 rubles / l.

The second direction (until recently considered affordable for the elite) is the preparation of drinking water of the highest quality. The basis of this direction is the production of practically chemically pure water through reverse osmosis, electro dialysis with its further mineralization (the addition of mineral compositions, substances and gases). Recently, there has been a sharp reduction in the cost and massive introduction of reverse osmosis technology, which makes it possible to reduce the cost of water preparation and make it available to the general population..

Reverse osmosis plants are touted as the most advanced in the preparation of "superior" quality drinking water. However, it has been proven that water after treatment in reverse osmosis plants is:

- distilled (demineralized);
- deionized (oxidized), because its redox potential (ORP), measured relative to the silver-chlorine electrode, is positive and lies in the range of + (200 ... 400) mV;
- its structure bears the "information imprint of sewer pipes contaminated with mucus and dirt", which is fraught with consequences for people with weakened immunity.

Such water is virtually undrinkable..

The use of new unique Russian technologies, patented devices and methods made it possible to create installations of a fundamentally new generation for the preparation of drinking water of the highest quality and control of its parameters in real time.

To date, the "Izumrud-SI" installation (mod. 01 os) has no analogues (Pic.1, 2).

Three main Russian components determined the essence of the new approach - the activation of chemically pure water, its mineralization and operational control of its properties. Mineralization is carried out on the basis of a unique Russian mineral composition "Severyanka ++", containing ions Ca⁺⁺, Mg⁺⁺, J, Se....

The unit is equipped with a built-in controller, display and flow sensors with a two-level indication system. Three modes of LEDs will warn the consumer in time about the need to replace (regenerate) filters, mineral additives.



Pic. 1. Exterior view of the "Izumrud-SI" installation (mod.01 os) for producing drinking activated water of the highest quality category with a given mineral composition and antioxidant properties.

The prime cost of drinking water is $\sim 0.2 - 1.0$ rubles / l (mod.01 os). The devices can be used in various fields of science and technology, where intensification of processes is required, due to the preparation of high-quality activated aqueous solutions with a given mineral composition and properties. In particular, the device can be used to obtain a new class of condensed media (solids, RU 2316374) and activated liquids, drinks (RU 2299859, RU 2194017). The scheme of the device "Izumrud-SI" (mod. 01 os) (Pic. 1, 2 and Pic. Patent RU 0074909) includes units for cleaning 1, 2, electroactivation 3, adding mineral elements and substances 4, as well as sensors 5, 6 and 9 with indication systems for monitoring the properties of liquids (degree of activation, pH, ORP, temperature T, dielectric constant, conductivity, etc.) and sensors 7 and 8 with an indication system for monitoring the composition of liquids (mineral elements, substances).

Sensors 5, 7, 9 are installed at the outlet of the device, and sensors 6 and 8 are at the inlet of the device in front of the cleaning units. The device can be additionally equipped with units 10 and 11 for liquid disinfection (Pic. 1, 2 and Pic. 6), a fine filter 12, a degasser 13, a storage device 14 for storing activated liquids, a heater 15 and a cooler 16 for liquids, as well as one or more ultrasonic activator 17. Typical sensors and indication systems (mineralization, ionic composition, substances, activation parameters, ORP, pH, T ...) can be used as sensors 5 - 9 with an indication system to control the properties and composition of liquids before and after activation. Typical devices based on membranes - osmotic, track, selective, hollow fiber, can be used as fine filters 12 and degassers 13; vacuum and ultrasonic deaerators; and their combinations. Accumulator 14 can be equipped with a system that maintains constant pressure and constant temperature.

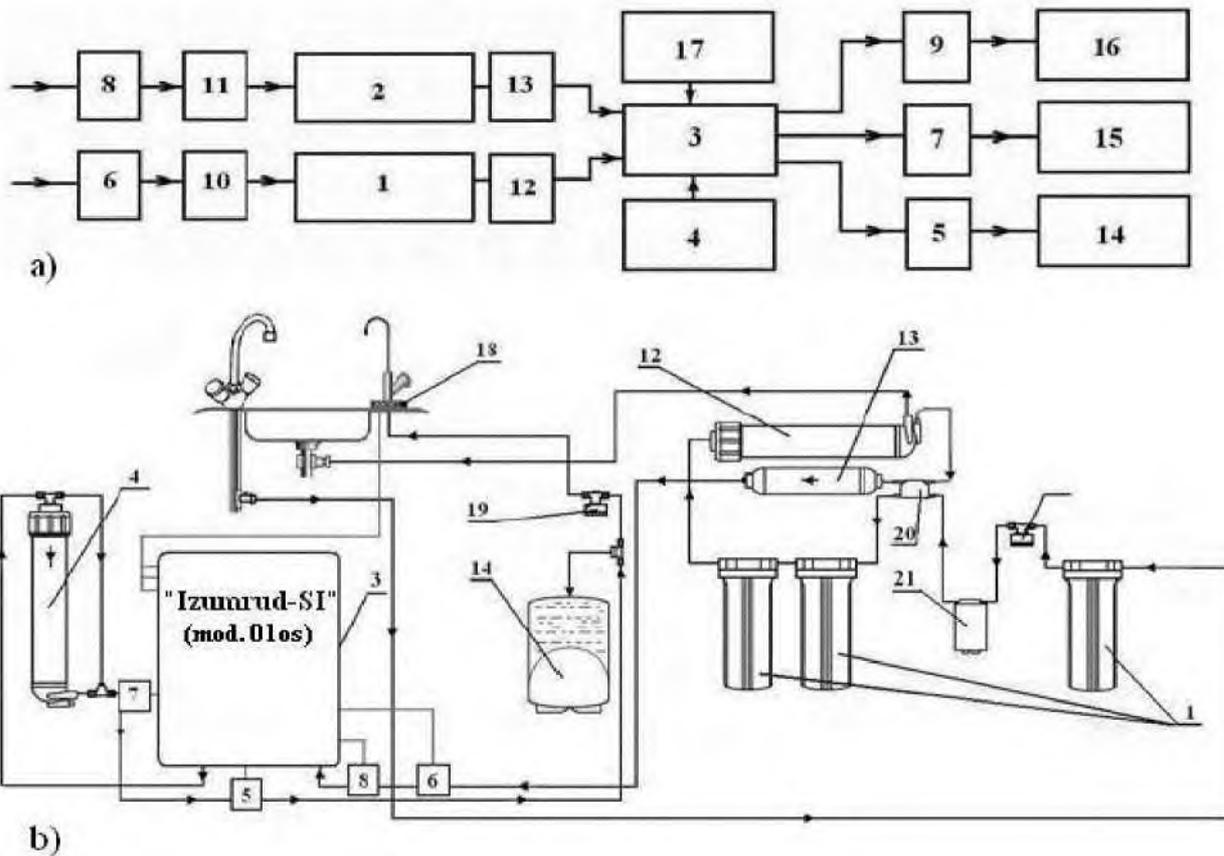


Fig. 2. Block diagram (a) and schematic diagram (b) of the "Izumrud-SI" installation (mod. 01os).

The proposed technology is aimed at increasing the efficiency of processing and the quality of the resulting liquids, monitoring their parameters, preventing overgrowth of electrodes with cathode deposits, clogging of diaphragms, expanding operational and functional capabilities, improving the ease of use and maintenance of the device. The second problem that has arisen at the present time is a sharp rise in the cost of disinfectants, sterilizing, detergents and medicinal products. Known installations of the "Steel" series, allow to solve this problem [12], but have a number of significant disadvantages. The proposed new installations [24, 27] make it possible to eliminate the indicated drawbacks and provide the population with inexpensive, highly effective disinfecting, sterilizing and washing solutions. According to GOST and taking into account the technical condition of water treatment facilities in Russia, the high cost of disinfecting solutions, the use of chlorination, etc. - the water from the tap was and will be technical for a long time, if the proposed outlet is not used. Therefore, at the present time we have two ways out based on the use of the proposed new technologies:

- bottling drinking water and disinfecting, sterilizing and washing solutions,
- bring technical water to the consumer, and then prepare drinking water and disinfecting, sterilizing and washing solutions of the highest quality from it.

The long-term state program "Clean Water" envisages the division of tap water into technical and drinking water. "We propose to consider the following options: water is disinfected using existing technologies, and then each entrance of the house has its own filter, which brings the quality of water to drinking water and supplies it to the apartment. Thus, the apartment has two taps - with technical water and with drinking water," - said Gryzlov - Chairman of the State Duma, Chairman of the Supreme Council of the "United Russia" party. (<http://aquaexpert.ru/news/2008/05/20/edinoros/>).

The authors of the project hope that the development of this direction and understanding of the need to separate water into technological and drinking water will solve numerous problems in the field of providing the population with environmentally friendly, cheap disinfectant, washing and sterilizing solutions, high quality drinking water and increase life expectancy.

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