SANITARY-HYGIENIC ASPECTS OF WATER - SUPPLY IN THE REPUBLIC OF TAJIKISTAN

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Abstract. Access to piped water was never 100% in Tajikistan. The mountainous topography of the country presents major physical challenges to extending the water supply network. According to UNICEF, 57% of the population (3.7 million people) is covered at present, including 93% of the urban population and 47% of the rural population. Just over 10% (650,000 people) use spring water, 3.7% (235,000 people) use river water, and nearly 25% (1.52 million people) use water from gorges, canals irrigation ditches or pools. Access to piped water does not mean simply access to safe drinking water. The case of Dushanbe is illustrative: 16% of supplies into of the Dushanbe water system are diverted directly from the river into local distribution net works without any treatment.

Keywords: Dysentery, metabolism, water-clearing

In the program document of the European regional bureau of WHO “Tasks on Health achievement for everybody ” (Copenhagen, 1991) the most important place is given to the problem of water quality. By 2000 all people should have access to adequate systems of drinking water supply, and the pollution of earth waters, rivers, lakes and seas should not represent threat for health of the man ".
Priority of this task is caused by that in accordance with the data of CART, 80 % of all illnesses in the world are caused by the use of substandard water and infringement of sanitary - hygienic norms of water supply. To the water factor is connected incidence of about 2 bln. man. The access to water pipe line water in Tajikistan never was absolute. According to UNICEF water pipe-line water uses about 57 % of all population (3.7 mln. man), switching 93 % urban and 47 village population. Little more than 10 % (650 thousand man) uses spring water, 3.7 % (235 thousand the man) river water and almost 25 % (1.52 mln. man) consume water from channels, hauzes and reservoirs. The access to water pipe-line water not necessarily means access to safe drinking water. On the data World Bank (WB) in Dushanbe 16 % of water acts in system of urban water supply from the river without clearing. About 65 % of system of water supply of republic of water-supply and water-division network are in a semi-destructive condition.
The centralized water supply in republic is carried out from 661 water pipes. A source of water supply for 90.6 % of water pipes is underground waters.
General productivity of all water pipes in republic about 2 mln. m^3/ day, from them by water pipes from superficial sources moves up to 400 thousand m^3/ day. Qualities of water more than 80 % of water pipes does not answer the sanitary requirements and rules because of absence of a zone of sanitary protection necessary complex of clearing structures and disinfection. 60-80 % of extents of water networks in connection with their deterioration require replacement and contain in a unsatisfactory sanitary - technical condition.
In capital of republic of Tajikistan of Dushanbe water for the economic-drinking purpose acts from four water inlet stations with general capacity 490 thousand m^3/ day. So on the data (WB) from total amount of the sent water in 270 mln. m^3 in 1999, the losses in a distributive network make 44 mln. m^3 per one

year, and the losses in inhabited sector have made 100 mln. m^3 per one year (Fig.1).
Usual measure on elimination superfluous water-use is the increase of the tariffs on water. However increase of the tariffs is stronger than all will strike on the deprived population. It is necessary to arrange, ensuring the realized relation to water as to the public boon.
The shortage of water especially hardly has an effect for a rule of schools and other public institutions. The joint research which has been carried out by UNICEF and ACTED, in many respects spills light on the given situation: the estimation of the projects on a sanitary condition 6OO of schools of Khatlon and Sogd areas has shown, that more than 45 % of schools has no access to safe drinking water (Fig.2)
Low skill level of the employees and significant reduction of financing have resulted in 50 % to decrease of clearing ability - with 245 mln. m^3 in 1990 up to 120 mln. m^3 in 2000. Less than 10 % of water of the basic network of water supply is exposed to clearing. In portable account on all population having access to water it means 44 litres of safe water on soul of the population per day. In Dushanbe 16 % of river water gets in distributive networks without clearing (Fig.3). On village water pipes in failure condition contain public of a water inlet column, there is no industrial laboratory control, submit water 2-3 hours per day, that results in fall of pressure in networks and infiltration of pollution. So for example, on 35 waterpipes which provide in the basic population of the regional centres, from existing 270 deep pumps 47 % do not function, and in areas of republican submission from 285 42.8 % do not function, to a Kurgantube zone of Khatlon area from 127 67 % do not function.
In sewer of a cleaning network in 1999 there were 480 failures, from them 460 in of Sogd area.
The pollution of water resources communal-household and industrial wastes is the disturbing factor requiring urgent intervention. The experts assert, that in the rivers of Tajikistan at 40-45 times more bacteria getting there with a household waste, than in the rivers the industrially advanced countries. In 1998 the dump of the polluted waters in the Vakhsh river has made 8 %, in Kafirnigan -60 %, in Syrdarya -23 %. The general pollution of water resources has made more than 6 <? on one inhabitant.
On a slide pollution of water resources has made more than 6 m^3 on one inhabitant.
On a the Fig.4 the results of the analysis of quality of water per last two years are submitted. Though the data are available only on Khatlon and Sogd areas, the chemical and bacteriological pollution obviously represents a serious problem. Given on a Fig.4 testify to necessity of urgent supply of urban and village authorities by the chemists for clearing water. From all cases of a typhoid in one Dushanbe city in 1997 63.7 % were caused by consumption of dirty water, 23.9 % absence of necessary quantity of water for washing utensils and 7.4 % by consumption of the polluted products of a feed.
In areas of irrigated agriculture, where the most part of the population uses mainly arik water, morbidity in 3-9 times is higher.
Strong dependence of Tajikistan on an agriculture and, as a consequence, influence of the chemists used in cotton-planting , and also presence others agricultural wastes render negative influence on health of the people. Such illnesses, as typhoid, diarrhea, dysentery, diphtheria and hepethite are caused by the use of the polluted water, while marsh-ridden sites provoke distribution malaria . To it testify the table on.
Water as one of the basic and most dynamical components is especially vulnerable to the factors of influence of anthropogenous character.
In conditions of Tajikistan in connection with high concentration of the population on valleys of the rivers and accommodation of the basic industrial objects in this zone the factors of influence of anthropogenous character get the special outline and urgency.
The choice of technology of qualitative drinking water, at which the probability of formation muthagene- active connections during processing is shown to a minimum, depends, first of all, on physical-chemical and microbiological structure of natural water, which is defined by climatic and hydrochemical conditions, character of water vegetation, anthropogenous loading on natural sources.

The traditional technological circuits of preparation of drinking water consisting of processes pre-chlorination , the processings by coagulant , filtering and disinfecting by chlorine reduce the total contents of organic impurity approximately on 50 %.

One of the sharpest problems in modern technology water-preparation is the formation collateral of chlorine-organic products at chlorination of water, which contains soluble organic substances.

The presence in water Cu, Mn, Zn, Al, Fe increases the contents trigalogenmethan in 2-3 times, and Pb- in 5-6 times. In result of chlorination are formed trichlormethan , chlorine-acetic an acid, chlorine-acetone , polichlorination, phenol, chlorate . It is known, that chlorate alongside with chlorite causes hemolitic anemia in an animal. At chlorination of waters containing lignines and humus connections, is formed ?????????? connection ? ? (3-chlorine - 4-dichlorinemethil -5-hydroxide -2 (5?) –phuranol), present in drinking water in concentration 2-87 ng/ dm^3.

Carried out onco-epidemic of supervision testify to presence of the raised level of diseases at the population of bodies of digestion and increase of risk of morbidity by a crawfish urinary bubble and tumour thick of bowels at the long use of chlorinate drinking water. WHO is recommended that the total contents ClO_2+ClO^-_2 + ClO^-_3 - in drinking water did not exceed 1 mg/dm^3. The parameters of quality inputs are conditionally subdivided into two groups: primary and secondary. The primary parameters characterize water of a source and include organleptic, permanganate oxidation, biological parameters, concentration of various components. The secondary parameters characterize collateral products of processing of water reagents, such as chlorine-organic connection (products chlorination) aldehides , kethone (products of ozonization) residual aluminium (at use coagulant on the basis of aluminium) residual phloculant etc.

The basic distinction between two groups is, that the primary parameters decrease, and secondary are increased with growth of dozes reagents . Thus, the secondary parameters impose rigid restrictions on dozes reagents.

At the analysis of systems of water supply the basic direction considers optimization water-supply in connection with the large expenses of energy for swapping of water. Much less attention is given to optimization of the charges reagents for processing water, though this problem becomes more and more urgent.

In process of coagulative clearing of natural superficial waters from them the most part of polluting substances causing turbidity and colour leaves.

Thus the contents ditoplanktone microorganisms, connections of various metals also is sharply reduced. In this plan by development of the modern technological circuits of water-preparation it is necessary to pay special attention to unit coagulation.

Most widespread coagulant are sulfate of aluminium (chloric iron, aluminate of ?sodium. From them sulfate of aluminium frequently is applied as in our country, and abroad. However recently in practice water-preparation and water-clearing tendency to use more effective coagulant - basic sulfates (Thus the contents fitoplanktone, microorganisms, connections of various metals also is sharply reduced. In this plan by development of the modern technological circuits of water-preparation it is necessary to pay special attention to unit coagulation.

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Essential lack SA is the decrease of efficiency it coagulating action at lowered temperature of cleared water. The increase of stability sol hydroxide of aluminium in these conditions (1-20^0?) slows down speed aggregate- formation and sedimentation, that results in increase of the contents of residual aluminium in the cleared water.

The aluminium in alive organism does not carry out any physiological function, though enters into structure of alive substance. Acting in organism with water the aluminium in the form insoluble phosphate is deduced with faecals , and is partially soaked up in stomach-intestinal a path in blood and taken out by kidneys. If the activity of kidneys is broken, there is an accumulation of aluminium accompanying with growth of fragility of bones , infringement methabolism Ca, Mg, P, F and development of the various forms anemia. Were found out and more formidable of display toxicity of aluminium: infringements of speech, failures of memory, turbidity of mind, convulsion . On the contrary, at research BSA and BCA more complete removal of clay and organic substances, reduction of quantity of the dissolved aluminium in the cleared water is reached. Is established, that the increase base BSA results in strengthening formed corns and improvement them sedimentative properties, and in a case BCA depending on quality of initial water the decrease of a doze reagent on 10-30 of % is reached.

The stage postchloration in technology of clearing is necessary for preservation of sanitary quality of water in networks because of presence at water of residual quantity biologically of oxide organic substances.

At absence disinfective reagent the quantity of bacteria contained in water can reach up to 107unit/sm^3. The introduction of chlorine even in quantity up to 3mg/dm^3 has the limited influence on the already generated biofilm and does not remove an opportunity of its formation on a pure surface. A major role in formation of a biofilm play contained in water organic bio-sulfate substance, i.e. presence of nutritious environment for bacterial growth. At decrease of concentration of the dissolved organic carbon (DOC) on an input in a network up to 0,1-0,2 mg/dm^3 it is possible to prevent formation of a biofilm on walls pipelines.

Thus, if to reach complete extraction DOC from drinking water, it is possible absolutely to refuse from post-chlorination.

The world organization of public health services formulates the concept of creation of technologies of preparation of qualitative drinking water, which consists of Creation of multiple barriers in process water treatment for complete removal of the pathogenic agents polluting substances and biodecomposed connections before realization final disinfection ;

Optimization of use at clearing water chemical reagent both development of physical and biological methods of clearing for decrease of necessary dozes chemical reagent.

The raised interest to such strong gaseous to an oxidizer, as ozone recently is shown. It, first of all, is caused by that at its application in drains any additional impurity are not brought in, and the most important disinfectant substance ozone works at 15-30 of time faster, than chlorine. Ozone is made on a place of consumption, ozonization promotes saturation of water by oxygen.

The basic expenses influencing on cost of process ozonization , are the capital expenses for the equipment and cost of the electric power. Now there is a lot of ways of perfection of this rather perspective process in particular, for the account, increase of concentration of raw material on the basis of complete replacement of atmospheric air by technological oxygen.

The analysis of world achievement in area of the most perfect technologies of preparation of drinking water shows, that one or two stages ozonization with the subsequent filtering of water through granulating active coal are strongly included as components of modern technology water-preparation.

It is remarkable, that denitrified bacterium in absence of oxygen or at its low concentration use nitrites for oxidation on organic substances. At surplus of organic substances, which it is necessary oxidize at presence appropriate of bacterial cultures a reduction nitrite up to molecular nitrogen is carried out.

By results of researches of last years it is possible to approve, that a way coagulantion , based on application as the additives natural powdery silicate together with basic coagulating reagent - by sulphate aluminium is perspective and promising.

For example, the introduction of clinoptilolit in cleared water together with coagulant at a parity 1:1 allows in comparison with a traditional way coagulation to increase a degree of clearing of water on muddiness - by 73 %, on colour - on 55 % and on residual aluminium - on 65 %.

The decrease of the contents of residual aluminium in the cleared water up to norm recommended a WHO is especially important that is there is less 0,2<mg/dm^3.

The optimum doze of coagulant $Al_2 SO_4$ for clearing water muddiness - 5,1 mg/dm^3 and colour - 49 hailstones makes 15< mg/dm^3 in account on Al_2O_3. The joint application of sulphite aluminium and powder manner clinoptilolit allows to save the charge coagulant on 10-15 %. Besides at the additive clinoptliloit is considerably increased hydraulic lump size formed corns and is improved them of sedimentative property.

Hydroxide of aluminium besieged on a granular material, effectively takes fluorine from water. Therefore disf;ourinazation of water produced , using processed by salts of aluminium sand, ceramist , breaking clinoptilolit . Maximal capacity on fluorine has alluminium modified clinoptilolit (0,5-10mg/g, which in the natural form does not take fluorine.

Thus, for achievement of high parameters on quality of drinking waters and embodiment in life of the concepts the WHO is necessary to strengthen research and applied works on modernization traditional and development of modern technologies of water preparation with wide attraction of local aluminium-silicate raw material of Republic of Tajikistan.