УДК 628.16
ББК 38.9

EFFECTIVE METHODS OF DRINKING WATER PURIFICATION ON THE EXAMPLE OF THE TUPALANG RIVER

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The article analyzes the appearance of secondary contaminants of chlorine and their ways of elimination by making appropriate changes to the technology of drinking water treatment. Generally, recommendations are given on how to change the technology for the production of drinking water in order to obtain positive results, using the example of a chemical analysis of the drinking water of Tupalang river in Surkhandarya region of Uzbekistan.

Keywords: volatile halogenated organic compounds, trihalomethanes, chloroform, technologies of water-preparation, ozonation.

ЭФФЕКТИВНЫЕ МЕТОДЫ ПОДГОТОВКИ ПИТЬЕВОЙ ВОДЫ НА ПРИМЕРЕ РЕКИ ТУПАЛАНГ

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В статье проведен анализ появления вторичных загрязнений хлора и их пути устранения с помощью внесения соответствующих изменений на технологию подготовки питьевой воды. В основном приведены рекомендации о том, как изменить технологию производ-

ства питьевой воды в целях получения положительных результатов, на примере химического анализа питьевой воды реки Тупаланг в Сурхандарьинской области Узбекистана.

Ключевые слова: летучие галогенорганические соединения, тригалогенметаны, хлороформ, технология водоподготовки, озонирование.

INTRUDUCTION

In the last decade, the study of chlorination products by modern analysis methods has shown that in the process of preparing drinking water, toxic volatile halogenated organic compounds (LGS) are formed, mainly methane derivatives. LGSs enter drinking water either as a result of contamination of water supply sources with industrial wastewater containing LGS, or are formed as a result of chlorination of water during the interaction of chlorine with organic substances present in the source water. They contain trihalomethanes (THM) - chloroform, dichlorobromomethane, dibromochloromethane, bromoform, trichlorethylene. The largest amount in the mixture of THM is chloroform. Carbon tetrachloride, ethylene chloride, and tetrachlorethylene were found in the LGS. These compounds are even more toxic than chloroform, but they are found in water in much smaller quantities. The concentration of LGS varies widely from 0 to 100 ug/L.

RESULTS AND THEIR DISCUSSIONS

If we consider the effect of chloroform on the sanitary regime of water bodies, organoleptic and sanitary-toxicological properties of water, then, as follows from the studies of Joung J.S and Singer P.C. models of the formation of chloroform from humic acids [2], chloroform for aquatic animals and warm-blooded animals is moderately toxic and is highly accumulated in organisms. A 2-point odor was detected with a chloroform content of 18 ug/L. Chloroform does not affect the color in the indicated amounts.

The maximum concentration LGS in the water of the Tupalang River, not affecting the sanitary regime of the reservoir is 50 ug/L. To determine the content of LGS, samples of source water and water were taken from a pure water tank (RFW). Analysis of the samples was carried out on a chromatograph LHM-80.

The analysis showed that drinking water contains a large amount of LGS: chloroform-93.7 ug/L, carbon tetrachloride -0.8 ug/L, bromodichloromethane-6.2 ug/L, tetrachlorethylene-2.7 ug/L. The total amount of LGS in drinking water is 103.4 ug/L, and traces of chloroform and 0.8 ug/L of carbon tetrachloride in the source water.

Thus, as a result of the technology used at the river station, drinking water contains an unacceptably high amount of volatile halogenated compounds.

Consequently, water with such an amount of LGS cannot be supplied to the water supply network and some correction is required.

Due to the fact that the removal of the formed LGS is a difficult task [3], it is advisable to consider the possibility of changing the water treatment technology in order to prevent the formation of LGS during chlorination.

Currently, there are several ways to reduce the content of THM to the established limits, the main of which are the following methods:

- do not use disinfectants that give THM as secondary products;
- use pre-treatment of water before chlorination to liquefy the level of total organic carbon;
- supplement the classic technology with adsorption treatment for liquefying THM.

Effective methods to prevent the formation of LGS are measures aimed at reducing the concentration of organic substances before the entering of chlorine [4]. As a result of consideration of various methods that prevent the formation of LGS and THM, the most promising method with preliminary ozonation of water seems to be the most promising.

Analysis of the above materials, taking into account the quality of the source water, made it possible to propose a purification method and composition of water treatment plants using natural biocenosis, microfiltration with preliminary ozonation and subsequent filtration.

In this technology, ozone is given an important place. Ozonation is one of the promising methods of water treatment [1].

The main properties of ozone, giving it an undeniable and unsurpassed superiority over other oxidizing agents, can be represented as follows:

- ozone has a high reactivity;
- in comparison with other oxidizing agents, it reacts faster and in smaller doses;
- oxidizes the precursors of trihalomethanes;
- reduces the molecular weight of complex organic substances and increases their biodegradability;
- removes organic compounds with a smell, color, taste;
- oxidizes organic compounds such as detergents, pesticides, phenols, as well as humic and tannic acids;
- when using ozone in an oxidizable medium, there are no products of the oxidant reduction that would pollute the oxidizable substance;
- ozone is either completely used and consumed for oxidation, or sometimes, when partially used, the reduction product is oxygen, i.e. ozone is an environmentally friendly oxidizing agent;
- oxidizes iron, manganese, heavy metals, cyanides, sulfides;
- destroys algae;
- destroys bacteria and viruses;
- ozone is produced at the place of consumption, which is especially important when introducing ozone technology in remote areas of the country where there is a problem of transportation and storage of traditional chlorine oxidizers and its derivatives.

CONCLUSION

Summarizing, it should be noted that the determination of LGS in drinking water is a very urgent task today, as they have a toxic effect on the human body. In this connection, it is necessary to use effective methods and technologies for purifying drinking water.

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УДК 336.76
ББК 65.05

LONG-SHORT EQUITY PORTFOLIOS: PERFORMANCE EVALUATION OF MULTI-DIMENSIAL STRATEGIES

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The main objective of the research is to estimate the backtested performance of multi-dimensional equity long-short strategies, which were constructed based on a combination of different signals (fundamental indicators). An evaluation of performance is conducted using the appropriate t-tests (derived by Novy-Marx, "Backtesting Strategies Based on Multiple Signals" [2015]) by estimating the statistical significance of the backtested average weekly returns for both the EU and US markets. The data set includes weekly stock prices of 2 553 firms for the period January 1990 to November 2015 for the US market and January 2000 to November 2015 for the EU market. The obtained results show that the combinations of signals provide statistically significant results for 1 out of 48 portfolios (under the assumption of zero transactions costs).

Keywords: backtested performance, data mining, overfitting bias, selection bias, multiple signals, stock returns, long-short strategy, fundamental indicators.