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To the question of water quality monitoring

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Abstract

This article is dedicated to increase the effectiveness of the water supply system of industrial enterprises in particular control system. The main problem in the operation of industrial water supply systems is significant overhead to produce quality feed water to cover deadweight losses. It is therefore necessary to consider the implementation of the program CAM Controlling to the main technological parameters of work.
The report presents the concept of quality control technology of cooling water under varying climatic and technological parameters of the water supply system. It is proved that the introduction of a controlling system allows to identify blockage of technology and increase water recycling company. Reducing water consumption will reduce operating costs by 14% and increase the sustainability of the enterprise.

Keywords: pure water, main pollutants, water cycle, sustainability enterprises, water balance, water cycle, corrosion protection, total hardness, oxygen, purge cycle, monitoring.

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1. Introduction

Zaporozhye - administrative, cultural and industrial center, which covers an area of 0.236 sq.km. with a population of more than 858,3 thousand inhabitants with density - 3637 people\ 1 sq. km. The city is among of the most polluted cities in Ukraine. The main pollutants of air and surface water are located in the Zaporozhye region.

2. Methods

Considering the rich theoretical and practical experience of experiments in reverse cycle industrial plants, undertaking numerical experiment and practical application of the results to the leading enterprises of the city.

3. Results

Condition of Dnieper river along the whole territory of Zaporozhye region is vital issue for society as Dnipro is the only source of drinking water Zaporozhye towns and villages located on its shores, a valuable recreational and economic resource not only for Zaporizhzhya region, but Ukraine as a whole. In addition, in Zaporozhye there is National Reserve "Khortytsya", which have great national importance.

Water resources of Zaporozhye region represented Kakhovske reservoir with a volume of 18,2 km3 of water, the Dnieper reservoirs contain 3.3 km3, 65 small rivers (longer than 10 km) with a total length of 2867 km (including within the area of 2638 km), 28 reservoirs on small rivers with a total capacity of 74.8 million m3 of water, 753 water volume rate of 162,3 million m3. Average annual runoff, which is formed in the region, is 0.5 km3 / year, drain the Dnieper River - 53.0 km3 / year.

The Dnieper River within the Zaporozhye region has a length of 154 km (aqueous address - from 204 km to 358 km). Within the city, Dnieper length is 34 km (aqueous address - from 300 km to 334 km).

Continuous development of modern civilization with its strong engineering and technical infrastructure entails permanent increase in consumption and as a result - a negative impact on indicators of water quality in watersheds, which in turn gives the ecological balance of systems and leads to the loss of their ability to heal itself.

Water quality Dnipro-river certainly affect the sanitary and epidemiological welfare of the population is inherently essential for stable operation of industrial plants.

Water of the river in Zaporozhye have small mineralization, has moderate color, and small weight of salts. Colour of water within 30-80 degrees. Mostly its value 30-40 degrees.

The value of color, permanganate oxidation, total organic carbon content in water due to the presence of natural organic compounds.

Formation of qualitative and quantitative water content Dnieper is connected with the marshland, which significantly contributes to water humic compounds.

A major component of natural organic compounds Dnieper water is fulvic acid. Their content in water is ten times the content of humic acids. The advantage Dnieper water content of fulvic acid on humic acid aggravates conditions such clean water by coagulation and oxidation.

In times of flood or when the death of phytoplankton due to its mass development may be a smell in the water.

Thus, the average indicators of water quality in the Dnipro River near the city of Zaporozhye for the 2011-15 year were the following meanings given in the table. 1.

All the above factors play a significant role in the work of businesses in any industry, including the heat-generating sector. Because of the quality indicators of water coming in enterprise depends uninterrupted operation of plants, their reliability and durability.

In case of lack of effective water treatment, the water circulation system is the accumulation of deposits in pipelines (scum and sludge) and pipelines. The accumulation of deposits in pipelines, in turn, results in a significant reduction in thermal conductivity, as scum and sludge poor conductors of heat (20 - 30 times less iron).

Table 1 - Quality water district river Dnipro

Quality	2011			2015		
	min	max	average	min.	max	average
Colour, hail	29	51	40,5	24	46	37,6
Turbidity, mg / dm3	<0,58	5,7	1,74	<0,58	7,6	2,27
pH	7,8	9,3	8,12	7,6	8,9	8,02
Alkalinity, mmol / dm3	2,8	3,8	3,18	2,5	3,4	2,93
Hardness, mg / dm3	3,4	4,8	3,86	3,2	4,1	3,65
Chloride, mg / dm	19	33	23,7	18	31	23,0
Sulfates, mg / dm3	24,8	63,7	40,99	22,8	51,1	34,27
The dry residue mg / dm3	239,6	356,1	291,61	215,4	298,1	256,78
Oxidation, mg / dm3	8,2	14,4	11,06	7,2	14,7	10,59
Nitrates mg / dm3	0,6	2,4	1,52	0,6	3,7	1,74
Aluminum mg / dm3	<0,04	0,19	0,042	<0,04	0,22	0,044
Iron general, mg / dm3	0,2	0,42	0,270	0,16	0,36	0,240
Oil, mg / dm3	0,01	0,04	0,027	0,01	0,03	0,022

Scale deposits on the walls of the boiler drum and superheater pipe prevents regulatory cooling. Temperature pipe increases, resulting in steam pressure they can form spots and end breaks even. When contaminated surface heating the boiler uneconomical, gas temperature increases, leading to a decrease in the efficiency of the boiler and overrun energy. In addition, failure to eliminate these deposits results in the failure of expensive processing equipment.

Water balance of the system - the ratio of income and cost of water to the changing of its stock for a certain length of time for the object.

Water balance sheet - the ratio of feed consumed and water required to meet the needs of the enterprise.

In calculating the water balance of heat generating companies other than the main volume of water consumed captured amount of water needed to cover water losses in the network, by evaporation, the purging and water supply system in amounts generally obtained by calculation.

Speed blowing determined based corrosion and deposits, and available indicators of quality and quantity of source water.

Under normal operating conditions of the system calculated the amount of feed is maintained constant. Thus, the amount of makeup water equal to the difference of the total amount of water circulating in the system, and losses in the system.

The number of watercycles shows the ratio of the concentration of dissolved solids in the circulating water in relation to pidpytnoyi water, and is determined by the equation:

$$N = \frac{C_R}{C_M} \quad (1)$$

where C_R - the concentration of dissolved solids in the circulating water;
C_M - concentration of dissolved solids in the feed water.

At steady state, dissolved solids, which are submitted to the system of feed water equivalent amount of dissolved solids that are removed from the system by means of blowing:

$$C_M \times M = C_R \times (B + W) \quad (2)$$

Combining the above equations yields:

$$N = \frac{C_R}{C_M} = \frac{M}{B + W} \quad (3)$$

$$N = \frac{E + B + W}{B + W} \quad (4)$$

Thus, the value of N is calculated from the equation of the water balance in the system.

The number of cycles regulate water circulation by regulating purge water because the constant loss at a constant operating conditions.

Figure 1 shows a typical relationship between the number of cycles of turnover and volume of water consumption. Increasing the cycles of concentration leads to a decrease in purge water and feed water savings. As shown in Figure 1, the amount of makeup water will be significantly reduced as long as the number of cycles water treatment reaches 5 times.

On the other hand, the operation of cooling water at a higher number of cycles of concentration of soluble salts can lead to deterioration of the cooling water and various technical problems. In addition, reagents for water treatment with certain limits their effectiveness, so you must determine the appropriate number of cycles of concentration. Thus, perfect water cooling system can handle the number of cycles of concentration from 3 to 5.

Continuous monitoring of water quality in fact required to prevent corrosion of the system, the occurrence of deposits. For sufficient water quality control is important to understand the impact of each parameter on water quality problems occur, and the relationship between water quality and chemical exposures.

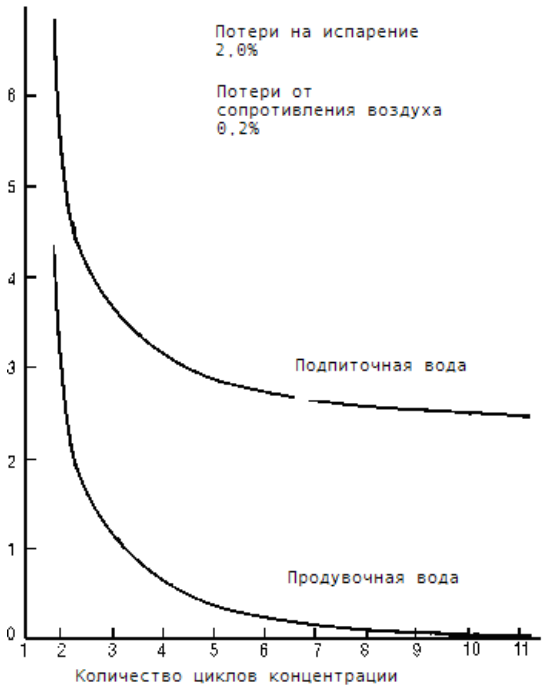

Fig. 1 The relationship between nutrient, water and purge cycles turnover number.

Most attention during the monitoring of water quality should be given to parameters given in Table 2.

Table 2. Controls the feed water quality indicators and their uses

The controls	Purpose
pH	Corrosion protection, savings deposits associated c corrosion products
Total hardness	Impact on surface heat transfer, reducing the formation of sludge
Oils and fats	Warning foaming and hit the pot
Soluble oxygen	Corrosion protection
Total iron and copper	Prevention of scaling on heat transfer surface corrosion
Hydrazine	Anticorrozion protection feedwater piping, boilers and condensate
The electrical	Prevent corrosion and deposits
Silicon dioxide	Prevention on the heat transfer surface

The purpose of monitoring of water bodies is to create an information security management in the water fund of rational use of water bodies and water protection from pollution and depletion, and to prevent the harmful effects of water (including their interaction with other components of the environment) and for maintaining a healthy of human habitat.

4. Conclusions

It can be concluded that with rapidly increasing urbanization importance of water quality control should be a priority for all humanity. It is banal to remind that the water - that's life, and what length it we will largely depend on our reasonable behavior.

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