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Scientific Principles Of Effluent Repositioning In An Additional By-Product Of A Water Basin By Global Warming Mode

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Abstract.
Bathymetric sensors have been installed in characteristic sections of the Dnipro River to collect data on changes in the level and quality of the water resource. Collected data on annual runoff, sediment accumulation on the river bottom, and operational forecasts of risk events for business owners and farmers. Increasing the energy efficiency of enterprises in the conditions of rising electricity tariffs is an important task for owners. Reduction of operating costs for repeated water treatment is possible thanks to the implementation of advanced cleaning and conditioning technologies, as well as taking into account the quantity and quality of wastewater. This reserve is for balancing water in the reservoir of the region. Drought parameters, volumes and quality of model mixtures for enterprises, geometric parameters of the recreational lake depending on morphological parameters of enterprises were studied. To improve the dynamics of biodiversity development, an intelligent system has been developed for the integration of all types of reclaimed water to replenish the reservoir balance. Ultrafiltration with immobilized enzyme membranes is offered for comprehensive accounting of conditionally pure water. The produced resource enters the reservoir basin and reduces the anthropogenic load on the buffer zone of the reservoir between cities. By restoring the resource of the buffer zone, biodiversity is renewed and fauna is restored. For the productive work of regional water regulators, auxiliary programs have been developed to provide information on technical and economic issues. It is suggested that the regulator and scientific experts work together productively to identify water drainage crisis zones.

***Keywords*:** sensors, salt, sediment, geometrical parameters, waste water, hydrological mode, chemical balance, feed balance.

Introduction

One of the main issues that the water sector is forced to answer under the influence of climate change is the improvement of the efficiency of water treatment facilities and the innovative area of water supply; resistance to various extreme weather conditions (drought or flooding) and increasing the share of reused water for auxiliary needs. Constant analysis of the results of temperature and bathymetric control, the water balance of the surface source is necessary for the development of a system of intelligent tools that will help in making strategic decisions for the preservation and development of the water basin.

The availability of tools for forecasting extreme meteorological events, necessary to identify critical points in each river system to feed the basin and determine priorities for urban investments. Such tools facilitate the understanding of trends in extreme events, and also help with arguments in favor of the construction or development of infrastructure in the region, such as reservoirs, increasing the drainage capacity of natural watercourses or creating networks of urban recreational ponds. The use of system tools allows checking the existing potential of the hydrological system and providing water to specific areas during a possible drought. Local researchers have shown how climate change will lead to a serious reduction of available water resources in the Dnipro (Zaporizhia), Samara (Dnipro), and Ingulets (Kherson) river basins while increasing the regularity of extreme events. Climate change will not only affect the amount of fresh water available, it will also affect water quality. The results of observations predict the impact of this extreme climatic factor on the quality of surface water and create the basis for the development of a system of tools to support a medium-term solution in lakes and reservoirs. Drinking water distribution systems will also be indirectly affected by climate change. Further research is planned to focus on the study of the growth of microorganisms and sediment in the water of main pipes. The main problem is the rate of growth of microorganisms in water supply systems under the influence of high average temperatures. Changes in the number and taxonomic composition of microorganisms can affect the quality of drinking water.

Recent research and measurement.

It is natural to determine the morphological changes in the cities wastewater, but the results of the influence to water-chemical balance of the reservoir are not given. Cities, where industrial enterprises are located, forced blending occurs naturally , but regulation for sustainable community development is not shown. For the development of new technological schemes of enterprises it is useful to know the multicomponent composition of the reservoir bed, and its possibility. The emergence of anthropogenic phenomena in risk regions has circulation impact to chemical composition of the reservoir bed bottom components. Suspension of anthropogenic phenomena will stabilizing the chemical and morphological mode of the reservoir. The formation of reservoir bed by relief-resistant materials suspends the landslides and the channel flow in highlands. The use of digital simulation helps in operational regulation and strategic planning. Organic morphology waste helps to accelerate the processes of fuel gasification, Such devices should be introduced to identify the desired morphology.

Experimental methods and aparatus

The needs of society and the greening of enterprises have influenced the introduction of on-line monitoring of bathymetric sensors in the characteristic crossings at Dnieper and Konka rivers: TDS meter, saltmeter, express tests of water rigidity, alkalinity, oxidation. Implementation the results of developed bathymetry programs, water mode, mixture, helps in operational and strategic planning of regional basin modes.

Methodology of research

The proposed water recovery system includes infiltration areas, recreational reservoirs, industrial reservoirs with cavitation devices, residential and communal facilities with local post-purification stations, and the main server of the enterprise, which controls reference quality indicators, consumption and balance of water in the reservoir.

The quality of the water environment of all constituent areas depends on the hydrological regime of streams, geological constituents of the soil, climatic changes, and the concentration of pathogenic chemicals in the effluents.

The change in water flow, the amount of sediment, the dynamics of sediment formation are among the primary factors of the experiment. The investigated parameters of hardness and salinity of water are fixed at all sections of the technological stream.

Depending on the volume of wastewater (500 - 1100 m3/hour), measurements are carried out every 4 hours during the day. The data are entered in a field journal with a record of the city of the study, the time of the study, and the measurement results. After conducting the research, the data are statistically processed and the experiment planning matrix is designed. To form calculations, influence factors (main X1, X2 and auxiliary X3) and optimization parameter U were used. The data were combined into a planning matrix, static processing of calculations was performed with access to regression equations of the second and third order with further graphical interpretation. The duration of the investigation of sedimentation of wastewater, depending on the temperature of the effluents, hardness and salinity of the water, is 15, 30, 90, 150 minutes.

The issue of soil dryness and moisture deficit is studied in the characteristic intersections of the city's reservoir, where surface and wastewater intersect. The final percentage of moisture at a depth of 5-10-25-40 cm from the surface was analyzed. We measure the percentage of moisture with the Vorell 89000 device. The device has the ability to measure acidity, humidity, soil temperature and lighting. Water quality indicators were recorded in field conditions by express tests of hardness, alkalinity and salinity. Depending on the amount of rain (1-75 l/sec), measurements are taken every 10 minutes. The data are entered in a field journal with a record of the city of the study, the time of the study, and the measurement results.

Researchers (10) developed an integrated drought index to assess its impact. The recovery index, as the most important drought assessment index, has been considered in many studies, but there are some caveats. This index is sensitive to the existing water infiltration of the soil, but to simplify the calculation of the index, the soil properties are considered to be attached to each individual soil layer at different depths [9]. Therefore, the integral definition of the index can cover the combined effects of various factors affecting the severity of drought. The PDSI, SWSI and SPI indices were combined through risk analysis as a new approach to quantify the impact of drought. Drought damage [11] is calculated through a set of indicators - hydrological and agricultural droughts.

Results of bathymetric data

The approach explores the localized dynamics of the tidal amplitude of the water level. The synchronous assumption makes it possible to raise the determined gradients directly from the amplitude of the tidal heights. Solutions obtained for the triangular shape of the lake c = (g × D)0,5. Equivalent results for a rectangular cross-section implies velocity change c = (0,55 g × D)0,63. Dynamic solutions are reduced to the functions ξ*, D and the friction coefficient of the reservoir bed f.

Results of the draught research

In the conditions of climate change, restoring the quality of water resources is extremely important, especially for technology parks. The research results show the main areas of potential recovery of the resource:

1. Remote sensing of moisture evaporation from the water surface.
2. Ground cleaning with artificial mixtures.
3. Creation of model water mixtures.
4. Implementation of recreational reservoirs in the smart city.
5. Cavitation cleaning of conditionally dirty sewage.

The effectiveness of ecosystem services offered to the user can be measured by the productivity of the specific area of the plot and the productivity of the entire geographical area.

The reformatting of urban planning functions imposes an architectural imprint on typical urban waste and requires the diversification of economic activity and the conduct of a mathematical experiment with a description of the 3rd order in these directions (Table 1).

Table 1: Factors and intervals of variation

	Lower level (-1)	General level (0)	Upper level (+1)	Variation interval	Factor
xx_1:	0,42	16,82	33,22	16,4	Total depth of rains, mm
xx_2:	0,025	347,5	694,975	347,475	Effective moisture saturation
xx_3:	10	4380	8750	4370	Work time

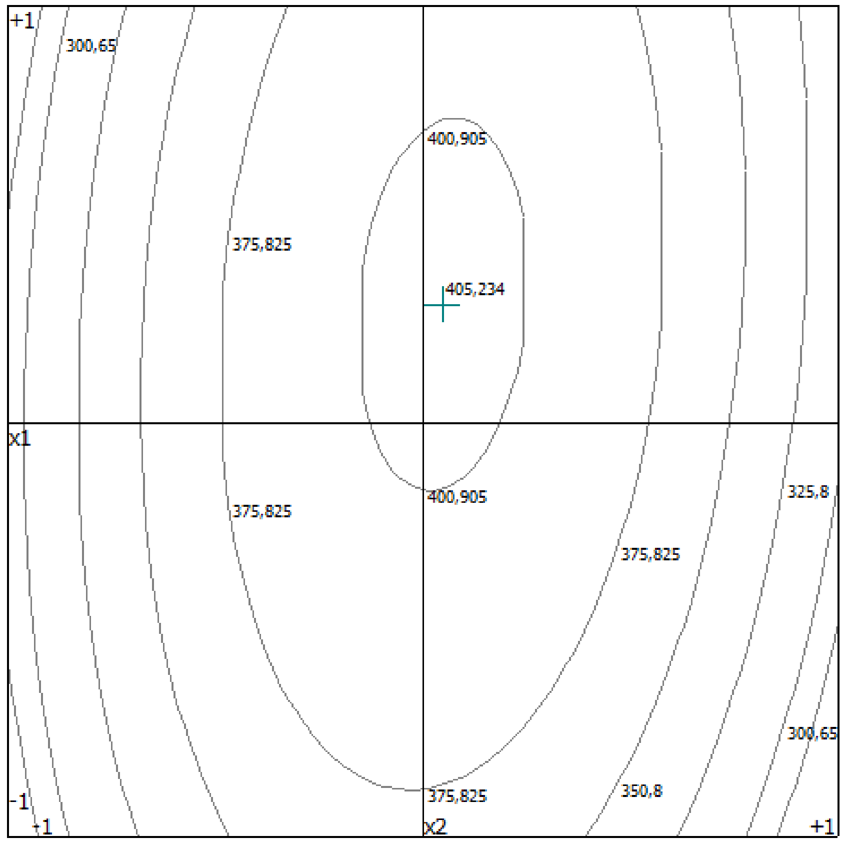

Fig. 1: Graph of the optimization parameter of crop productivity due to drip irrigation with reclaimed water

Studies of mixture formation.

Interest in mixed or partially mixed lakes is based on the feasibility of using the body of the lake for hydrological mixing and sedimentation processes. The study proves that, temporarily vertically, a constant relative gradient of axial density, Sx = (l/ρ) (∂ρ/∂x) is linearly proportional to the salinity of water. Previous studies have shown the following expression: for the length of saline penetration, LI, into the buffer volume of mixed lakes:

$$L_I = \frac{0{,}007 \times D^2}{f \times U^* \times \frac{1}{3} U_o}; \qquad (1)$$

The results are related to the determination of the location impurity invasion along the movement of the lake to derive the main indicators of the penetration zone.

For intermediate quantities, 1h <TK < 6h, inter-tidal stratification is probable, especially due to tidal runoff.

The impact of wastewater is equal to more than 3/4 of the salinity of the lake:

$$T_V = \frac{0{,}78 \times \left({}^{L_f}/_{2} \right)}{\frac{2}{3} U_o} = \frac{0{,}0025 D^2}{f \times U^* \times \frac{1}{2} U_0^2}; \qquad (2)$$

The xi values include hydraulic compensation for reducing the inflow velocity as the depth decreases, and ignore axial flow changes. Tidal expansion of saline solutions:

$$E_x = \left(\frac{2,41}{\pi}\right) U^* \frac{2}{3} P \quad (3)$$

Research equation of mathematical model taking into account constant factor:

$$Y = 51,355-0,614x_1-3,25x_3-0,528x_1^2 + 0,936x_3^2 + 0,823x_1x_3$$

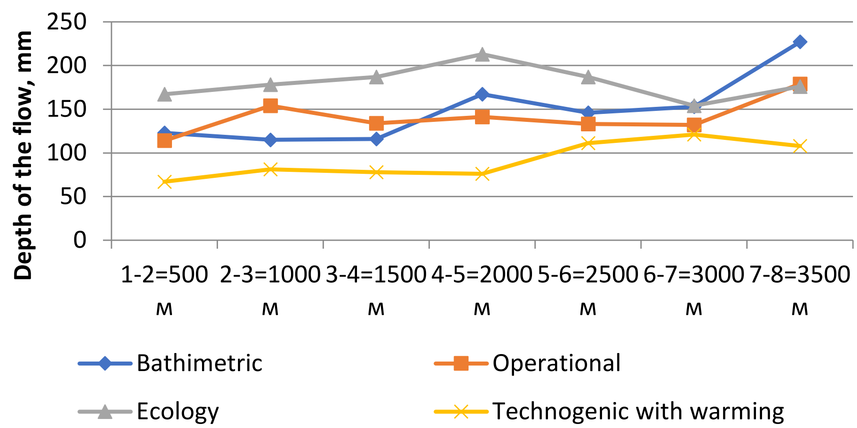

Fig. 2: The amount of pollutants at the intersections of the reservoir within the city (agrarian segment)

Proposals for the provision of additional services of the water supply system have entered into the practice of international rain management (MDM), which increase the efficiency of specific rainwater to reduce the concentration of pollutants and restore up to 75% of the runoff.

Table 2: Determination of the advantages of sedimentation cavitation

	Hardness mg-eq/dm^3	Alkalinity mg-eq/dm^3	Salinity, mg/l	Ns caco$_3$	Ns MgOH	N cycle
Light industry	7,5	6,8	570	27,5	119	35
Metallurgical (u.c.)	12	11,2	630	68,41	120	42
Metallurgical (u.d.)	14	9,8	1120	78,19	261	78
Food industry	8,1	6,8	610	23,87	14	12

Table 3: The signal to prevent the river from being swamped

Risk prevention			
River	Indicator	Crossing	Value
Impact on the environment			
Type of pollutant	Pb	Concentration	0,5
Biodegradation of the pollutant	Yes	Not biodegradable	No
Result			
Position	A2	Influence situation	A2
Draught	≥30		Indicator places
Draught	<20		Region
Draught	<10		Country

Draught	<3		Territory
			Other
Transfer	A3	Economic losses of waste	A4
Transfer evaluation	≥10000	Direct economic loss	≥10 млн
Transfer evaluation	8000	Other situation	
Transfer evaluation	1000		
Transfer evaluation	100		
Transfer evaluation	<3		
Risk level	III	Middle	

Influence of monitoring for the increasing water potential

Linked hydrodynamic and mixing models and mixing of pollutants both horizontally and vertically are required as a basis for modeling sediment transport. Dynamic processes occurring in seconds (turbulent movements), up to hours (tidal fluctuations), lunar (seasonal fluctuations) with the corresponding spatial scales from millimeters to kilometers.

The diversity of lakes makes it unlikely to develop a single integrated model. Moreover, maintaining flexibility at the module level is necessary and desirable to provide a wide range of applications and provide program forecasts.

To understand and quantify the full range of threats from GOK, the whole system requires models - the inclusion of impacts on marine biota and their consequences.

In practice, the relationship may be limited to the representation of physical indicators (statistical emulators) by the application of integrated parameters, such as stratification levels or multiplicity of dilution.

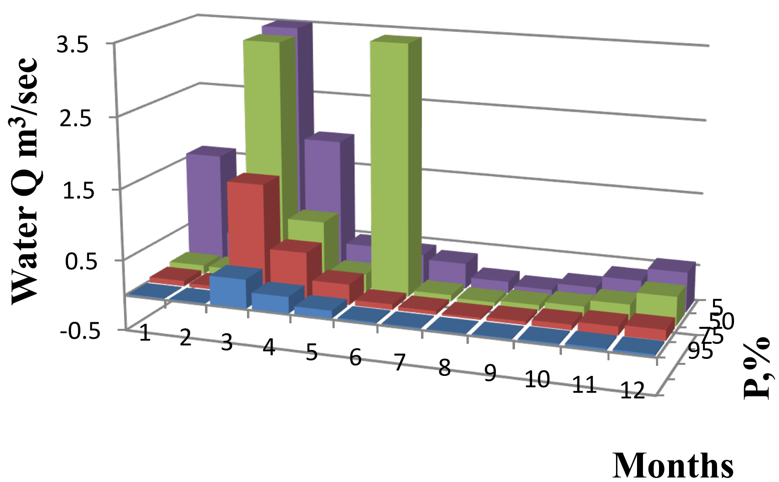

Fig.3: Directions of development Konka river basin.

Need comprehensive surveillance networks using synergistic aspects of the full range of devices and platforms integrated with the simulation. Continuous on-site monitoring is likely to be the most expensive component of any surveillance network, and it is important to optimize such a network.

To assess current model developments required programs for monitoring test parameters, ideally they should extend to water levels, currents, temperatures and salinity, waves, turbulence, bed features, sedimentary, botanical, biological and chemical components:

1) shore inflow sensors along the entire length of the lake, supplemented by a level sensor in deeper channels;

2) regular bathymetric studies, such as 10-year intervals with more frequent re-surveys in areas of lakes;

3) network of mooring platforms with tools for measuring currents, waves, sediment concentration, temperature and salinity.

The practical use of the tool is to planing different scales of man-made load for short-term and long-term project periods:

Strategy 1 (5%) - research models, strategic planning of river basins, annual runoff, amount of sediments, volume of fresh resources.

Strategy 2 (50%): research models in which algorithms, numerical grids and schemes are developed using specific measurements in the enterprise and technological research.

Strategy 3 (75%): previous operational models with (productive) fully developed algorithms for evaluation and development (from time measurement of observations or accumulated reservoir beds).

Strategy 4 (95%): operational models in everyday use and are usually supported by a constant monitoring network.

Discussion.

The types of industrial waters and the specificity of technological processes require the design of water treatment plants for each workshop, plant, and individual technological process. The need for further purification of water from the point of view of chemical indicators is assessed by biological, technological and chemical indicators of water quality. The progressive need for environmental friendliness of production forces municipalities to implement new environmental codes and to attract specialists for the development of new technological processes and products. All this is based on the cost price of the final product, which brings bioengineering to a new regional level of integration of potential waste from local budgets into new by-products. The supply of new scientific products is driven by time and climate change. Such systems make it possible to replenish the city's water balance by 4 million m3 of water per year.

Conclusions.

1. The existing deficit of fresh water of the water basin can be compensated by the production reserves of the runoff.
2. Implementation of a system of remote quality sensors allows to improve the water balance up to 4 million m3 of water per year.

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