Automatic diffusion mixing system for watering in regions with high water sales

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***Abstract*— The article devoted to combined construction of two filtration systems of salt water in one pump unit. The article considers not only constructive solutions, but also issues of automatic control of the technological process.The article has results of experimental stand, dates, particular qualities of sensor and distance control of SIM900D.**

***Keywords*— control system, diffusion mixing, conductometer , reverse osmosis, Arduino IDE.**

I. Introduction

Since ancient times, agriculture has been the main source of food for mankind, but it should be noted that the quality of agricultural products is declining every year and the main cause of this problem is soil degradation, increased salinity of fertile lands.

The main substance of the above problems Stra in tries of Central Asia, Africa, and India is the high salt content in the water, which is used for irrigation .

High st salinity ie water harms not tol ko on soil fertility, but also uses its local population [1].

II. FORMULATION OF THE PROBLEM

The most important issue in the design of drainage systems is the correct assignment of the depth of drainage and the distance between them, on which both the intensity of drainage and the cost of construction, and therefore the economic efficiency of drainage, depend [2,3]. High accuracy and quick calculation of drainage parameters, including the depth of the drainage and the distance between them are an important problem.

III. DECISION

Currently, there are no universally recognized methods that allow predicting the production development in organizations with satisfactory reliability. It should also be noted that strengthening the economic freedom of participants in the reproduction process at the regional level causes a probabilistic image of the economic processes taking place in different sectors and forces to apply the scenario approach and multivariate alternative ways of finding solutions. To solve this problem, it is proposed to use methods of economic-mathematical modeling and multidimensional statistical analysis. Changes occurring in the modern economy lead to the compilation of new and improved systems of economic and mathematical modeling, enabling to analyze the dynamics of the regional organization development and take advantage of large amounts of actual information.

The research employed the methods commonly applied in economic sciences: general scientific (dialectical method, analysis and synthesis, comparisons and analogies, and graphical method); special (systemic, statistical-economic, economic-mathematical, experimental methods, comparative analysis and mathematical modeling).

Information base of the research is made up of official state statistics; normative legal acts of federal and regional levels; statistical data of the Ministry of Agriculture of the Republic of Uzbekistan; reference materials of specialized publications on the topic; data received from the participants in the greenhouse farming market, own research; the Internet data (industry portals, websites of greenhouse crops producers, articles and reviews).

IV. Results

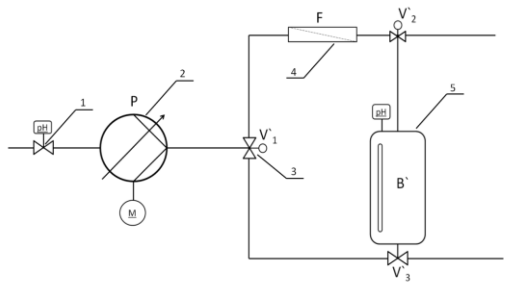
To reduce these impacts to a minimum level, a system that will give the ability to combine the process of irrigation and water supply of drinking water in a pump unit.

The design combines a diffusion mixer and a reverse osmosis filter for a centrifugal pump .

This design is installed in a pumping station for individual use, which are very relevant in the above regions .

The pump station is designed for individual use for portable use in small villages and rural areas to produce the irrigation of small plots of land and the implementation of water supply consumer th .

The design consists of a centrifugal pump, a differential pH sensor , a diffusion mixer, reverse osmosis, and four two-position solenoid valves, shown in Figure 1 [1].



1 - conductometric sensor; 2-pump unit ; 3- two position solenoid valve; 4-reverse osmosis; 5 tank diffusion mixer .

Figure 1 . Scheme of an automatic diffusion mixing system. .

The system has two operating modes, the upper mode is a mode in which only reverse osmosis is activated and is used to reduce salinity to drinking water standards.

The lower mode is the diffusion mixing mode . A tank is installed in this part of the structure, where the pipes are connected from the source, from where salted water comes from and from reverse osmosis, from which filtered water comes. The proportions of the water in the tank are measured using a conductivity sensor.

Conductometric sensor detects, operation switching valve and the by gives the ability to control the salt level inside the tank. At a certain volume of water in the tanks, the lower valve automatically activates , which delivers this water to the irrigated place. The ratio of salt and filtered water is compiled according to a given sketch of the microcontroller of the system.

The principle of operation of the system consists of determining the level of salt and on the basis of this indicator the volume of work is established as the proportion of salt and drinking water . Signal set to the source conductometric sensor , is compared with a predetermined parameter E and the controller determines the volume range of the predetermined value .

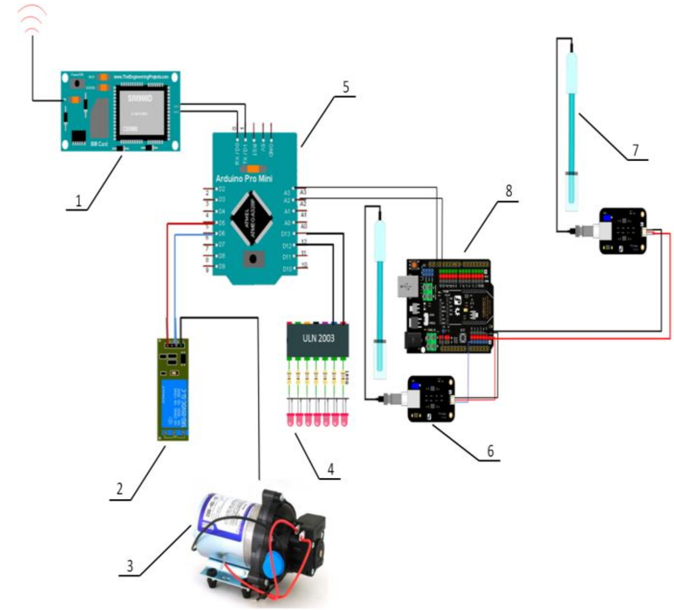
After determining the ratios, the proportion of water is controlled using valves to which a signal is supplied through the controller.

For the experimental stand, a board was assembled designed on the basis of Arduino elements in Fig. 2, and a diagram of the connection of the board elements is shown .

The board consists of an Arduino pro mini controller , an ULN 2003 amplifier for controlling two position valves, a SEN0116 conductivity meter, and a GSM SIM900D system for remote control and process monitoring [4].

Arduino ID E software environment was used to calculate variable indicators by a sensor for comparing and compiling codes . The system responds to the command of the logical operation of comparison If and variables are entered , the main parts of the sketch are shown on the Arduino ID E panel in Figure 3.

Comparison of the indicators of the sensors and the indicated values is compiled using the indicated aisles in the value operator, which is indicated by the sketch example in Figure 4, which shows all process changes. When comparing, the limits of pure water ("Water Is neutral (safe)") and with increased acidity ("water Acidity High") are shown.



1- SIM900D; 2- executive mechanism relay module; 3-pump unit; 4-amplifier; 5- controller Arduino Pro mini; 6- BNC connector ; 7-pH sensor; 8- sensor module.

Figure 2. From the circuit board of the automatic control system.

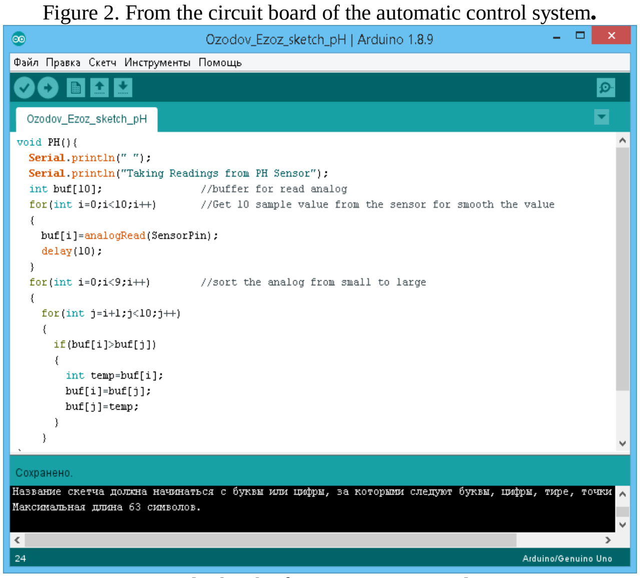


Figure 3. Code sketch of an automatic control system on the Arduino IDE platform

Figure 4. Sketch of code for comparing indicators on the Arduino IDE platform

To increase the accuracy of the diffusion mixer in the Arduino IDE, the pH value and error are not more than 0.3 and compared with 7.00 and the difference was changed to "Offset" in the sample code. Correction was made using the operator "# define Offset 0.00" to "# define Offset (x)" the data value x is variable parameters with a tava waters s and further indicators of water are loaded into the controller [2] .

When calibrating , the equipment is connected in accordance with the schedule, that is, the pH electrode is connected to the BNC connector on the pH meter board , and then the connecting lines and pH meter boards are used when connected to the long port 0 of the Arduino controller . When the Arduino controller receives power, the sensitive element is activated. A sample code is downloaded to the Arduino controller based on the water composition of the region. The pH value of which is 7.00 or is adjusted at the input of the BNC connector [3] .

The system is easily adaptable, for this, a base of the required value and calibration of the conductivity sensor are compiled, all indicators are loaded into the controller and the ranges of chapels of the required norms of sketch operators in the Arduino IDE are replaced.

CONCLUSIONS

This system is intended for small rural areas and for small populations. The design is designed to reduce the use of clean drinking water, but it should be noted that the minimum use of clean water depends on the salt in the water, which makes this system not perfect.

The autonomous system compares the quality indicator and determines the ratio of liquids, which very favorably affects the fertility of the soil during irrigation.

In the absence of a developed system and the program is functional and within normal limits. Remote monitoring of the system makes it possible to collect data on the composition of water around the clock and when alerted, they will turn off the device.

The main problem of the system is the calibration of the sensors to the side of the optimal work point for which the dismantling of the controller is required.

REFERENCES

[1] *Galston A.* , Life of a Green Plant , Moscow: Mir, 1983, 398 p.

[2] *E.Ozodov* " the C overshenstvovanie automation equipment and processes in the implementation of pumping stations for individual use in the ecological zone A Ralsko sea " b , the XXII International. Scientific conference on advanced of the living environment, Tashkov n t , 398 p.

[3] *Tatomir.A* . (2018). "Conceptual model development using a generic Features, Events and processes (FEP) database for assessing the potential impact of hydraulic fraction on groundwater aquifers" Adv ances in Geosciences pp.185-192.

[4] Monk S. Programming Arduino : Getting Started with Sketch es , USA: Tab pub . 2011 pp.34-38.