

EFFICIENCY OF COMPUTER SIMULATION OPTIMIZATION OF FLOTATION TECHNOLOGICAL PROCESS

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ABSTRACT

This article presents information on the effectiveness of computer modeling for optimizing the flotation process. Scientific research is being conducted worldwide to develop scientific foundations aimed at improving technological automated computer systems of processes and devices based on systems thinking and analysis. In this regard, special attention is paid to the effective management of the composition of technological processes for flotation of potash ores, monitoring the concentration of valuable components and reducing them in waste, efficient operation of the flotation system, reducing energy costs, and reducing the content of harmful substances in technological environments to a minimum level. At the same time, the search for optimal solutions for technological processes in practice is one of the main areas of technical development aimed at increasing productivity, improving product quality, reducing costs, facilitating working conditions and protecting the environment

Keywords: Process, model, computer, modeling, system, analysis, equipment, production, technology, flotation.

INTRODUCTION

In global production, research and development in the field of manufacturing, modeling and optimization of technological processes in the context of modern scientific and technological progress have allowed the industry to increase productivity by reducing energy consumption and improving product quality due to the widespread use of modern technologies in the creation of highly productive, reliable and cost-effective technological equipment.

To date, the world has developed scientific foundations aimed at improving technological automated computer systems of processes and devices based on systems thinking and analysis. Along with this, scientific research is being conducted to effectively manage the composition of technological processes of flotation of potash ores, regulate the concentration of valuable components and reduce them in waste, productive functioning of the flotation system, reduce energy costs, and minimize the content of harmful substances in technological environments.

MATERIALS AND METHODS

In our republic, a number of works are being carried out to reduce energy consumption and ensure high production efficiency and increase the productivity of technological devices and equipment based on highly efficient production technologies and system management. In this regard, it is important to improve the technology, enrich existing minerals, use new, more efficient technological devices, create and apply environmentally friendly methods of ore mining and other technological processes of potassium ore flotation.

Mikhailov A.P., Kozin V.Z., Dashchenko A.I., Soroker L.V., Khmaro V.V., Nekrasov B.D., Gaponov G.A., Koltunova L.N., Barchenkov V.V., Yusfin Yu.S., Pashkov N.F. and in our country Gulyamov Sh.M., Artikov A.A., Barakaev N.R., Sanakulov K.S., Nasirova Sh.N. and others conducted scientific research.

Optimal technological processes of flotation during ore enrichment have been developed, conditions for optimal control have been determined, reagents have been created to improve the adhesion of valuable component particles with gas bubbles, improved static and dynamic characteristics of the apparatus have been implemented, models of flotation apparatuses and mathematical models have been manufactured. A technological process for flotation of potash ores and methods for improving the device, as well as the technology itself, have been developed.

RESULTS AND DISCUSSION

The issues of mathematical modeling are solved by the identification-analytical method. The flotation apparatus of potash ore - sylvinites is studied as a system consisting of a number of elements, the processes and phenomena occurring in the elements of the flotation apparatus are considered and analyzed. The analysis of the flotation line of potash ore is carried out on the basis of systems thinking based on the systems approach (Fig. 1). The flotation apparatus of potash ore is studied as an object consisting of a number of elements. The processes and phenomena occurring in the elements of the flotation apparatus are analyzed.

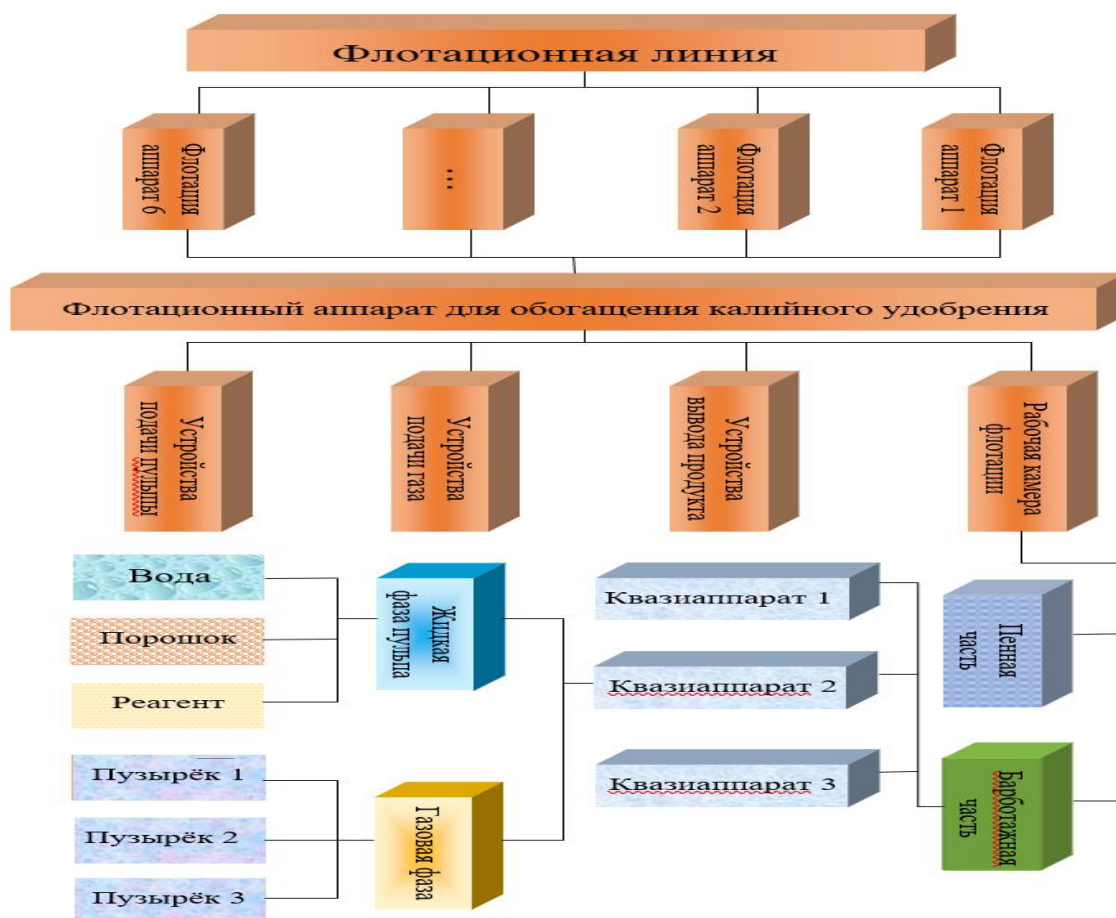


Fig. 1. Hierarchical system of flotation apparatus for enrichment of potassium fertilizer

The method of systems thinking in the multi-stage analysis of the object of a multi-quasi-layer apparatus for selective flotation of potassium chloride during enrichment of sylvinite ores is shown. A method of a multi-stage method for constructing analytical and experimental mathematical and computer models of objects is proposed.

A method has been developed and mathematical and computer models of the flotation process of potassium fertilizer have been constructed based on the sequential combination of computer models of quasi-objects of the third, then the second hierarchical stages. The change in the concentration of potassium components in the flotation apparatus over time is shown. It has a hyperbolic character for both liquid and gas phases.

A technique for constructing a mathematical, computer model and an intelligent method for optimizing the technological process of flotation in the production of potassium fertilizer has been developed. Based on the models of processes in quasi-apparatuses, a computer model of the bubbling cube of the flotation apparatus of potassium chloride has been obtained. The experiments show that the process in the flotation apparatus is stable. Changes in output parameters, in particular the concentration of potassium salts in the liquid phase decreases from the initial value, and increases in the gas phase to the equilibrium concentration.

A decrease in the concentration of potassium salts from 31.0% to 2.6% in the pulp and an increase in the gas phase and froth layer from 0% to the equilibrium concentration are shown. An increase in the number of impeller revolutions also increases the air flow into the bubbling layer. This is reflected through the electric power supplied to the electric motor ($N = 10 - 30$ kW).

CONCLUSION

The multi-level method of systematic analysis was successfully used. Multi-stage system analysis allowed to develop computer models, optimal flotation conditions in the bubble (foam) zone, and to develop a control system for the object under study. The issues of mathematical modeling were solved by the identification-analytical method. Potassium ore - sylvinite flotation apparatus was studied as a system consisting of a number of elements, the processes and phenomena occurring in the elements of the flotation apparatus were considered and analyzed

REFERENCES

1. Nasirova Sh.N., Isakov A.F., Artiqov A.A., Mirzaqulov X.Ch. Reasoning System in Analysis of Bubbling Zone of Flotation, On the Example Of Potash Ore Enrichment. Jour of adv research in dynamical & control systems, vol. 12, special issue-06, 2020, DOI:10.5373/JARDCS/V12SP6/SP20201063,558-565p.
2. Исаков А.Ф., Артиков А.А., Насирова Ш.Н., Холиков М.М. Программное обеспечение для расчета пяти квазислойной флотации калийных солей. Агентство по интеллектуальной собственности Республики Узбекистан. Свидетельство об официальной регистрации программы для ЭВМ. Свидетельство № DGU 20120198, 15.05.2020.
3. Исаков А.Ф., Артиков А.А., Насирова Ш.Н. Улучшение качества флотационной продукции интеллектуальным исследованием. Управление качеством на этапах

- жизненного цикла технических и технологических систем: сборник научных трудов Всероссийской научно-технической конференции (27-28 мая 2020 года)/ ISBN 978-5-907205-39-1, ЗАО «Университетская книга». Курск, РФ. 2020. -с.18-20
4. А.Ф.Исаков, Ш.Н.Насирова, А.А.Артиков. Системное мышление в анализе флотационного аппарата и моделировании процессов переработке руд. Монография. - Ташкент, «Фан», 2022, 159 стр.
 5. Sh. Nasirova, M. Kholiqov, GEOTECH-2024. E3S Web of Conferences 525, 05009 (2024) <https://doi.org/10.1051/e3sconf/202452505009>
 6. Nasirova Sh.N., Artikov A., Isakov A.F. Systems thinking in the analysis of a flotation apparatus and modeling of ore processing processes. Monograph. - Tashkent, “Fan”, 2022. 159 p.