DISPOSAL OF MINING INDUSTRY WASTE (USE)

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Most of the developed foreign countries have for many years been trying to re-use man-made deposits in order to save their mineral raw materials, by developing waste processing technologies in order to use industrial waste. For example, since 1993, the share of secondary products in the production of non-ferrous metals in the USA is 55% for copper, 28% for tungsten, and 25% for nickel.

A similar idea of recycling secondary products is observed in Canada, Great Britain, South Africa, Spain and other countries.

In the 70s of the last century, two devices for re-separating copper were put into operation at the "Arthur" and "Magna" factories of the USA, which enrich 100,000 tons of copper-molybdenum ores per day. Waste is classified in hydrocyclones, sand is re-crushed and sent to flotation. In the processing of copper-bearing sands with a content of about 0.09%, the two devices gave a low-grade enrichment of less than 72 tons per day, and allowed to increase the production of copper at the factory from 234 tons to 259 tons per year.

Waste from the "Toledo" plant in the Philippines contains 0.08% copper. A device for re-flotation of the sand part of the waste is installed in the factory. The resulting concentrate containing 1.0-1.5% copper is sent to the main plant, where it is combined with the control flotation concentrate, regenerated and refined until the final concentrate is obtained. The use of this technology in the factory allowed to increase the total separation of copper from 87.84% to 91.69%, the amount of copper in enrichment from 28% to 30%. The amount of copper in waste is reduced to 0.05%.

In Montana, USA, 2 tons of gold and 4 tons of silver are extracted annually from tailings containing 0.84 g/t gold and 2.8 g/t silver in Mandiskey mine ore enrichment.

In Canada, selective smelting of 0.45% copper waste from a copper beneficiation plant with bacteria has been used to increase the separation of copper to beneficiation by up to 40%.

In Bulgaria, 0.1-0.15% copper-bearing waste was obtained three times cheaper than the beneficiation obtained from raw materials.

In South Africa, 3.5 tons of gold and 696 tons of uranium are extracted from the waste of gold separation factories containing 0.53 g/t of gold and 40 g/t of uranium.

In Russia, due to the need to solve the problems of ore processing of man-made mines of the Urals, the target program "Processing of derivatives of man-made mines of the Sverdlovsk region" was adopted.

Sludge (500 tons per year) of Svyatogor OJSC Sorinsk concentrator is involved in processing using flotation and magnetic separation, where copper, apatite and iron-vanadium enrichments are obtained, as well as sand used in construction. Since 1998, flotation

processing has been carried out in this enterprise in order to extract copper, iron and precious metals from waste containing pyrite. Copper and pyrite enrichments are obtained.
Since 2005, the slag obtained at the "Urtaural Copper Smelting Plant" OJSC has been processed by the flotation method, and copper enrichment and iron sands are obtained. The production capacity of the processing line is 1200 tons of slag. 1 mln. 6 thousand tons of copper, 200 kg of gold, 6 tons of silver, and 900 thousand tons of iron sand are obtained as a result of processing tons of slag.
Waste slag is processed according to the flotation scheme at the slag enrichment plant of JSC "Uralelektromed". Extraction of copper from slag is 65%, during flotation more than 90% of zinc goes to waste, method of extraction of zinc has not yet been developed. The resulting concentrate containing 10-15% copper is prepared and sent to the metallurgical plant.

In addition to the examples of the processing of man-made mineral objects, there are a large number of scientific developments that study the methods of processing secondary mineral raw materials (6-13). The methods of obtaining copper, gold rare metals, calcium enrichment, molybdenum, magnetite-hematite enrichments, construction enrichments, etc. from man-made mineral raw materials are presented in the listed sources. However, these developments have not been implemented on an industrial scale for various reasons.
Mining wastes in the territory of Uzbekistan are studied by many authors. Among them, the experiments carried out on the study of the wastes of the copper beneficiation factory (MOF) of the Almalyk Mining and Metallurgical Combine (OKMK) are important.

In 1999, the "SredazNIItechnology" institute developed a complex for digging and processing waste from the landfill of 5.5 million tons of OKMK MOF-1 per year. The institute proposed two options for waste processing: 1) purchase of technological machines for the enrichment factory from the German company Krup Polizius; 2) Purchase of machines from the Swedish company "Svedola".
As a result of the calculations, it was found that the planned factory is economically unprofitable in terms of collective enrichment: copper - 67.07%, molybdenum - 45%, gold - 55.2%, silver - 35.2%. In this case, the amount of copper in collective enrichment is 10.0%, the amount of molybdenum is 0.126%, gold is 14.53 g/t, silver is 40 g/t. One-year interest was 9533 thousand US dollars according to the 1st option, 8143 thousand US dollars according to the 2nd option.
Since 2004, experiments have been carried out on selective melting of 4,411 tons of large sand fraction containing 0.165% copper in the flotation waste with the help of bacteria. As a result of 28-month bioselective smelting experiments, the separation of copper into beneficiation was 48%.
It is known that from the point of view of ecology, the technology should be waste-free. This means all the main and auxiliary materials included in the process - raw materials, reagents, fluxes, additional materials, etc. should come out only in the form of goods or in the form of semi-finished products used in other enterprises. It is difficult to achieve a complete elimination of waste, but reducing its volume is one of the main directions for improving the production of non-ferrous metals. Low-waste technology has been developed for many types of mineral raw materials.
The creation of low-waste technology is directly related to the problems of rational use of reagents and related components. Depending on the method of using reagents and basic materials, technological schemes can be divided into five groups:

- reagents are used in processes and removed with waste products;
- reagents are used in processes and released as intermediate products processed in other enterprises;
- reagents are used in processes and released as by-products;
- additional operations on the regeneration of reagents are foreseen in technological schemes;
- reagents are regenerated within the technological cycle without special operations, closed cycle technology is used here.

Obviously, how to use reagents and materials is not only an environmental problem, but also an economic problem. The schemes of the second, third and fifth groups are more important among the schemes presented above.

All but the first of the above schemes are used in low-waste technologies.

Reagents are regenerable without additional operations (group 5) closed cycle, characteristic for most hydrometallurgical plants of non-ferrous, rare and rare metals.

Hydrometallurgical methods of processing zinc enrichments are closed cycle - sulfuric acid is regenerated in the process of electroplating of zinc - therefore this method belongs to group 5.

Removal of reagents from the process as by-products creates transport problems (Group 3). Selective dissolution of sulphide products using ammonia is associated with getting ammonium sulfate, which is a valuable fertilizer by-product. However, it is not profitable to produce the product due to its long distance from the consumer. In this case, schemes of group 4 and 5 are more universal. Due to the uncertainty of ways to solve the technological problem posed in the creation of man-made waste processing schemes, its solution requires the use of the "inverse dependence" method. In fact, such inaccuracies can be solved by making corrections many times during the execution of the work, because they are directly and inversely related to each other.

The following general scheme is proposed to solve the problem:

- choosing an actual problem;
- creating ideal hypothetical models;
- establishing the level of study of selected models and their individual elements, identifying possible difficulties;
- choosing a theoretical solution to the problem; comparison of identified models, selection of options for the development of feasibility studies;
- preliminary feasibility assessment and selection of a relatively promising technology option;
- selection of technology and equipment and introduction of new technology.

The need to process mineral raw materials and metals depends on their nature. The maximum full use of raw materials can be achieved only by combining several industrial enterprises into one structure. In order to rationally use mineral resources, it is necessary to create an inter-sectoral production association consisting of several enterprises in different sectors. In this, the integration of various industrial production branches into a single complex takes place, the sequential processing of raw materials (for example, the casting of pig iron from ore and the transformation of pig iron into steel, and then the production of some finished product from pig iron) or playing a supporting role in relation to each other (for example, processing of by-products, development of products packaging items) includes stages.

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The necessity of merging production enterprises has been studied by many researchers. In the 40s and 50s of the last century, N.N. Kolosovsky worked on the formation of the Pribaikal complex, in connection with the unification of production enterprises.
made a number of conclusions and proposals on the use of natural resources. They can be summarized as follows:
- geographical grouping of similar technological unifying enterprises in the territory of the industrial zone;
- raw materials of industrial enterprises. disposal of waste and by-products taking into account the direction of production;
- technological integration of production processes (energy, raw materials, etc.);
- economic unification by means of mutual exchange of production products;
- organization of general energy, transport, sorting and distribution stations if necessary;
- organization of infrastructure for all production enterprises.

Integrated use of existing resources by combining production enterprises allows the waste of one enterprise to be used as a primary product by another enterprise.

Regional approach to the processing of material and energy resources
allows to reduce waste of raw materials, to reduce costs of materials, energy, transport, labor, to expand the type of manufactured products.

The creation of a production-economy system uniting various production enterprises in the regions creates the need for the creation of a common technological chain. In this case, located in the same territory and connected with each other by the issue of maximum use of the primary product with minimum costs an opportunity to develop regional technology will be created. The analysis of the current state of the complex use of man-made waste allows us to conclude about the need to create a production-economic system connected with a single technological chain of processing mineral raw materials and generated industrial waste in the regions.

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