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Research on Improving the Technology for Extracting the Tungsten Product from the Tailings of the INGICHKA Factory and the Cake of NPO AGMK JSC

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ABSTRACT: In the Republic of Uzbekistan, research on improving the technology for the production of non-ferrous metals has received a new development when using man-made production wastes in the form of raw materials, non-ferrous and noble metals. The strategy of action for the further development of the Republic of Uzbekistan defines the tasks of "raising industry to a qualitatively new level, deep processing of local sources of raw materials, accelerating the production of finished products and mastering technologies." in the form of raw materials of non-ferrous and rare metals, which was accumulated in the tailing dump of the Ingichka factory and NPO Almalyk Mining and Metallurgical Plant JSC. Its processing will allow the plant to significantly expand its raw material base without significant capital expenditures.

KEYWORDS: intermediate product, cake, stale tailings, jigging, screw separator, diaphragm jigging manina, combined technological scheme.

I. INTRODUCTION

The methods of gravity separation include: concentration in heavy media, jigging, concentration on tables and sluices, screw separation and a number of special separation methods based on the combined action of mass forces (gravitational, centrifugal, magneto-hydrodynamic and magneto-hydrostatic). Gravity beneficiation methods are used for preliminary beneficiation of coarse ore (heavy media and coarse jigging), in the main beneficiation scheme and in finishing operations. The coarseness of the lump material to be concentrated is in the range of 100-0.02 mm. A condition for the effective use of gravity beneficiation methods is a sufficient difference in the density of the separated minerals. When enriching lumpy material in heavy media or jigging, this difference should be at least 100-150 kg / m3, for the separation of fine-grained material - 2-3 times more. In addition to density, the behavior of mineral grains is significantly influenced by their size and shape, and for fine-grained material also by surface properties[1].

The processing of finely disseminated starting material is reduced to screening and crushing of the top product of the screen to a size at which maximum opening of grains of useful minerals is obtained with minimal over-grinding. In practice, this size is in the range of 1.5-2 mm. The practice of a number of tungsten factories processing finely disseminated ores shows that jigging in the grinding cycle does not give satisfactory results. In this case, concentrates are obtained with a low tungsten content, with a low extraction of the useful mineral in them.

Subsequent processing of material of this size can be carried out by depositing in combination with concentration on tables. But during jigging, only more or less large grains of useful minerals are extracted. Dump tailings from jigging

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at tungsten mills are rare and usually require further processing. Therefore, enrichment using jigging alone does not give good results.

II. GEO SCATTERED TYPE BIG DATA IN APPLICATION

Processing of all material by concentration on tables is possible. In this case, concentrate, middlings and tailings can be obtained. But installing low-performance concentration tables for processing large classes is irrational. For coarse material, jigging machines are more efficient devices than concentration tables. Therefore, it is rational to classify the crushed material into a number of classes, for large ones use jigging, and for small ones - concentration on tables.

The jigging intermediate product requires cleaning in order to extract a certain amount of concentrate from it, therefore it is advisable to send it to concentration tables processing the product of the second or third hydraulic classifier.

Tailings and sludge from ore processing by gravity method contain up to 20-30% of material with a particle size of 0.15-0.075 mm, with a tungsten content 3-4 times higher than the content in the original ore. This material enriches the overall plant tailings and reduces recovery. If this product is separated from the general tailings and subjected to additional processing, then the losses in the factory will be significantly reduced. For this, a classification is introduced into the technological scheme in order to divide the tailings into sand and sludge. The sand is sent to the dump, and the sludge is thickened. The thickened product is subjected to additional processing [2].

When developing a technological scheme for the enrichment of mineral raw materials, we took into account:

- technological schemes for the processing of finely disseminated wolframite ores of domestic and foreign processing plants;

- technical characteristics of modern equipment used and its dimensions;

- the possibility of using the same equipment for the simultaneous implementation of two operations, for example, separation of minerals by size and dehydration;

The selected samples were initially enriched on a jig and on a concentration table: the resulting middlings were sent to flotation enrichment after regrinding. Oleic acid is used as a scheelite collector. To create an acidic environment, add HCl to pH = 2.

The reagent T-92 was used as a foaming agent. As a result, a tungsten intermediate product containing 29-30% WO3 was obtained.

The first series of experiments on stale tailings of the Ingichka factory was carried out by the gravity method. The pulp was enriched on a screw separator. The concentrate was sent to the concentration table. A product was obtained containing 0.56-1.2% WO3. The content of WO_3 in the original product is 0.06%.

III. SYSTEM ANALYSIS

The second series of experiments with a sample of 50 kg was enriched on a jigging machine with cleaning. As a result, a middling product containing 8-10% WO3 was obtained. The next 10 experiments were carried out by a combined method. We send the received middlings to flotation. The technological scheme consists of the following operations: sieve analysis, slurry preparation, enrichment on a jig with cleaning, enrichment on a concentration table, main flotation, control flotation and double cleaning. As a result, it is possible to obtain a tungsten intermediate product containing 15-20% WO3. Below are the schemes of cake enrichment of NPO Almalyk MMC JSC and stale tailings of the Ingichkinskaya plant. (fig. 1-2)

The obtained tungsten intermediate product was agitated with HCl for 15-20 minutes. As a result, the WO_3 content increased by 3-5%.

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The results of experimental data show that when enriching the cake, NPO Almalyk MMC JSC and stale tailings according to the recommended scheme gives a good result. When enriching the cake according to this scheme, it is possible to obtain a tungsten concentrate with a WO_3 content of -49-50%.

When enriching stale tailings by gravity on a jig and on a concentration table with two cleaners

makes it possible to obtain a tungsten intermediate product with a content of 27-29% WO_3.

The enrichment of cake and stale tails on a screw separator and on a concentration table does not give the expected results. Thus, we offer the enrichment of cake and stale tailings by the gravity method on a jig and on concentration tables with two cleaners [3].

The results of the experiments show that the intermediate product yield is 1.69-2%, the content is 29-30% with the recovery of WO3 53.7-62.5%.

Table 1

Results of testing the technological scheme

Product	γ **, %**	β^{WO_3} **, %**	$\gamma\ \beta^{WO_3}$	ε^{WO_3} **, %**
Conditioned concentrate	1,69	29	49,01	**53,7**
Dump tails	98,31	0,5	49,75	**46,3**
Initial ore	**100,00**	**0,176**	**17,600**	**100,000**

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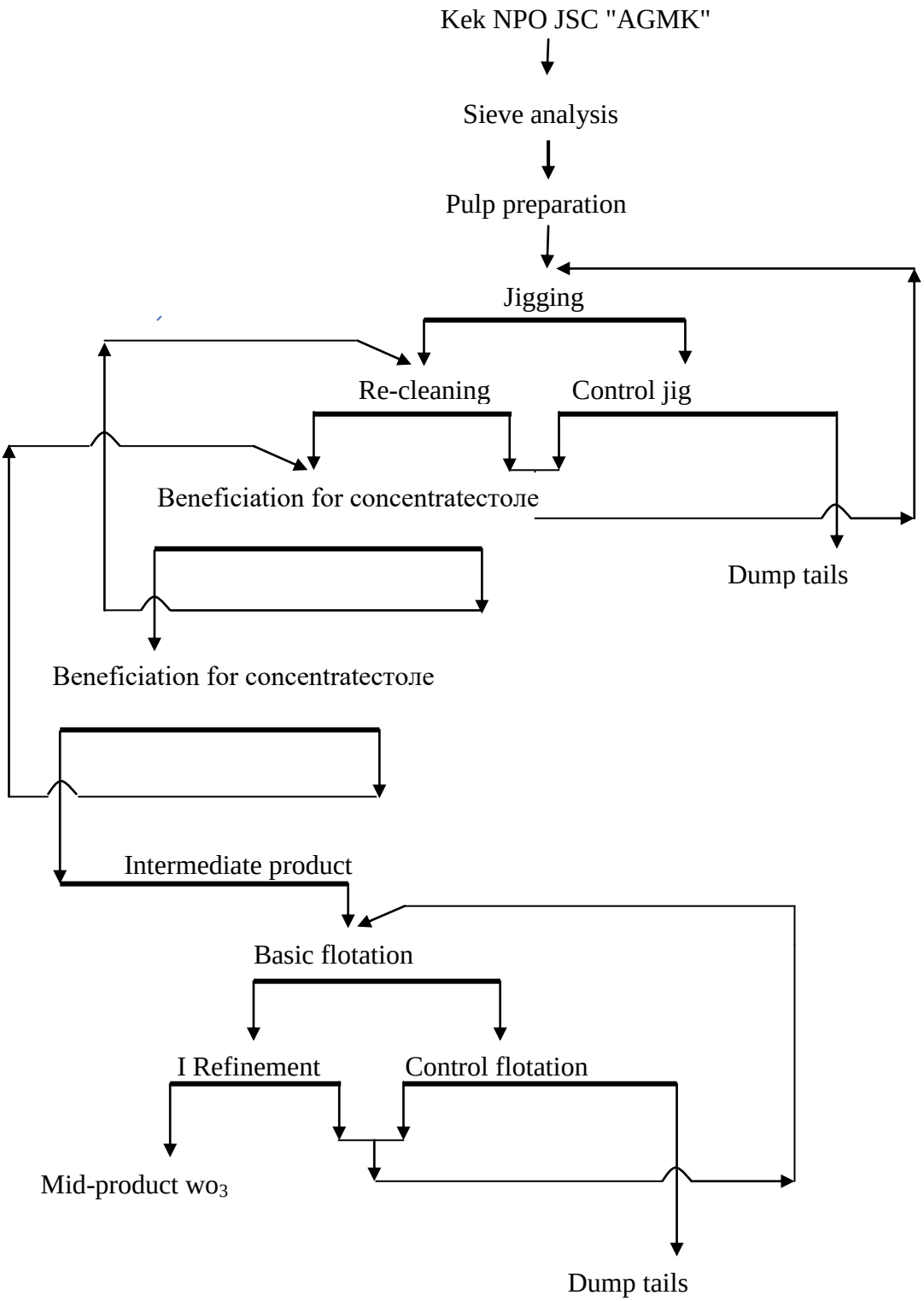

Fig. 1 Process flow diagram of cake enrichment NPO AO "Almalyk MMC" in a closed cycle by a combined method.

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IV. INPUT DESIGN

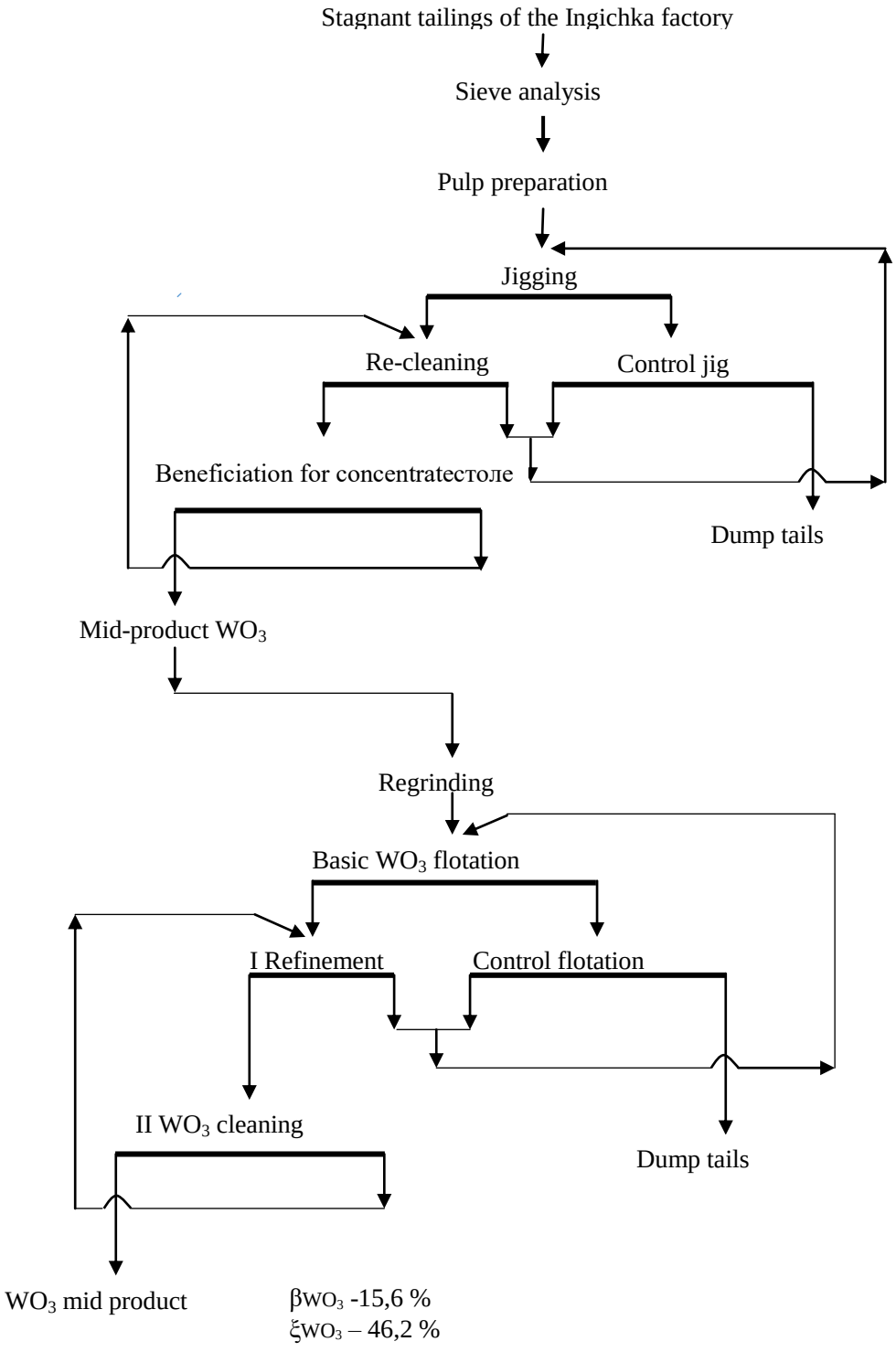

Fig. 2 Technological scheme for the enrichment of stale tailings of the Ingichka plant according to the combined scheme in a closed cycle.

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Thus, it has been established that the most effective way to extract WO_3 from cake with a size of -3 + 0.5 mm is jigging with cleaning, concentration on the table with cleaning from the size classes -0.5 + 0.1 and -0.1 + 0 [5].

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