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THE LATEST TECHNOLOGIES FOR REUSE OF SLUDGE OF METALLURGICAL ENTERPRISES IN UKRAINE

СУЧАСНІ ТЕХНОЛОГІЇ ПОВТОРНОГО ВИКОРИСТАННЯ ШЛАМІВ МЕТАЛУРГІЙНИХ ПІДПРИЄМСТВ УКРАЇНИ

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The cycle of resources (in particular, blast furnace, steel and rolling mill slags) in the chain of the mining and metallurgical complex of Ukraine was considered and analyzed. In the course of the study, it was established that the volume of production and the degree of processing of all secondary processing resources in Ukraine are lower compared to European indicators. The main

processing technologies and their shortcomings are considered. New technological schemes of deep processing or enrichment of tailings, sludges of metallurgical enterprises and enrichment factories are proposed [1–4, 7].

Waste-free processing technology of ferrous metal ores is a modern concept of sustainable development of ferrous metallurgy, which starts from exploration of deposits to industrial or domestic use of finished products. On the other hand, finished products or waste become a source of raw materials for reuse, where they will produce the same or more often a different type of marketable product. The raw materials for the production of cast iron, steel and ferroalloys in ferrous metallurgy are iron quartzites of local origin and by-products (waste), so they can be divided into the following groups: associated non-ferrous and rare metals; production waste in the form of dust, sludge, slag and other products containing ferrous metals; non-ore mineral raw materials (crushed stone, sand, flux raw materials); technical water. Metallurgical enterprises of Ukraine produce slag and dust in large quantities. Pyrometallurgical processes are huge sources of waste if not recycled and disposed of properly. With the rapid increase in resource consumption worldwide, the available land for landfilling large volumes of metallurgical slag is decreasing and, as a result, the cost of disposal is becoming higher. The impact of global warming and conservation of natural resources are common environmental problems in the world. In addition, slag compounds lead to air, water and soil pollution, as well as adversely affect the health and growth of plants, etc. Samples of material from three places of metallurgical sludge storage (blast furnace and converter) of PJSC Kametstal with the purpose of additional extraction of oxidized iron and slag for further reuse are considered.

Table 1

Results of chemical analysis of metallurgical sludge

Fraction, mm	**Yield, %**	**Total yield, %**	**Fe_2O_3 content (measured), %**	**Fe content (calc.), %**	**Note**
+0,315	13,29%	100,00%	81,77	57,23	Coarse scale
-0,315+0,071	24,99%	86,71%	79,14	55,40	
-0,071+0,05	4,77%	61,72%	70,87	49,61	
-0,05	56,95%	56,95%	74,52	52,16	Mostly magnetite grains
Total	100,00%				

We examined the size of metallurgical sludge and its iron content (Table 1), and found that beneficiation can be done by gravity and magnetic methods. The ideal goal is to develop a sustainable closed-loop system that can convert all valuable resources sent as waste into useful products and achieve full recycling.

The metallurgical industry directs its efforts to the minimization and processing of slags to achieve environmental goals. Various metallurgical slags are formed in the process of mining, refining and alloying of steel. The large amount of slag and stricter environmental regulations make recycling and disposal of these slags an attractive alternative to reduce and ultimately eliminate disposal costs, minimize environmental pollution and conserve resources.

Many existing technologies for processing slags and sludges of the metallurgical industry do not provide deep processing of dust from sintering and blast furnaces. The size of such particles usually does not exceed 150 microns, and the amount of iron reaches 20–35%. For such slurries, it is proposed to create a technology with gravity and magnetic devices for maximum iron extraction (iron content in the enriched product is usually 56–62%) [3–7]. Metallurgical enterprises of Ukraine often store blast furnace, sintering and steel-rolling sludge together in accumulators for the purpose of sedimentation of solid particles and return of process water to the turnover of the enterprise. The concentration of solids in the flow varies from 20 to 250 g/l depending on the current operation of the metallurgical plant.

A general gravity-magnetic technological scheme for the processing of sintering, blast furnace and steelmaking wet slurries has been implemented. This technology will make it possible to additionally extract iron with a content of β = 56–62% and a yield of finished products γ = 25–45%, depending on the mining area. Processing tailings are a mixture of quartz and limestone grains with a content of oxidized iron θ = 6–18%, which can be used as a mineral filler. Thus, deep processing of waste from blast furnace, sintering and steelmaking industries is possible, with subsequent extraction of conditioned iron concentrate suitable for loading blast furnaces, and obtaining mineral raw materials for construction.

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STUDY OF THE POSSIBILITY OF RECYCLING WASTE FROM METALLURGICAL PRODUCTIONS USING GLASS TECHNOLOGY

ДОСЛІДЖЕННЯ МОЖЛИВОСТІ УТИЛІЗАЦІЇ ВІДХОДІВ МЕТАЛУРГІЙНИХ ВИРОБНИЦТВ ПО СКЛЯНІЙ ТЕХНОЛОГІЇ

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Currently, 9.1 billion tons of waste have accumulated in the Dnipropetrovsk region, 8.6 billion of which were generated as a result of the work of the Kryvbas mining and processing plants. A significant part of this