

## **“A novel method for improvement of quality of a magnetite concentrate.”**

Insufficient quality of magnetite concentrates is a common problem in many Ukrainian beneficiation plants. Low-intensity drum magnetic separators that are employed at all stages of the process, including the final enrichment stage, are not suitable for improvement of the grade of the concentrate.

The reason is a high intensity of the magnetic field, usually exceeding 100 kA/m (0.13 T), generated by the drum separators. This magnetic field induces magnetic flocculation of the magnetite particles, which results in entrapment of quartz particles in the flocs.

A new technique for enhancement of the grade of the concentrate has been proposed [1]. It is based on the flow of slurry along the walls of vertical ferromagnetic plates placed in a magnetic field. Intensity of the magnetic field increases in the direction of the flow from almost zero in the upper section of a plate to about 25 kA/m (0.03 T) or less in the lower part. Such a magnetic field is too weak to induce magnetic flocculation. The magnetic force that is needed to attract the magnetite particles to the plates is achieved by generating a high gradient of the magnetic field. By reducing the rate of magnetic flocculation the quartz and locked magnetite/quartz particles are released and removed from the concentrate.

Table: Enhancement of the grade of magnetite concentrates.

Samples from Poltava Mining	Feed into the final stage, (% Fe)	Grade of concentrate (% Fe)		Grade of non-mags (% Fe)
		Existing circuit	Novel method	
Formation K22	66.3	67.1	68.8-69.1	14-16
Formation K23	63.6	64.7	65.7	17.6

The method has been tested on laboratory scale and the results are summarized in the Table. It can be seen that the grade of the formation K22 of the Poltava Mining concentrate was increased by about 2 per cent, while that of the formation K23 concentrate of the same beneficiation plant by 1.0 per cent.

Ore of the last formation is difficult for treatment.

This method can be used for removal of liberated magnetite particles to final concentrate from every stage of a dress circuit. Hereinafter an example of such treatment of a sample of magnetic middlings (Fe=45,9%) of the first stage of separation of the Central beneficiation plant, Krivoy Rog. Fine particles, less than 0.063 mm, were extracted from this sample. After separation of these fine particles in field of low intensity magnetic gradient an obtained magnetic fraction was separated using our method. As a result a magnetic product, which iron content is 68,9 %, has been obtained. This product can be regarded as the final concentrate. Its mass yield is 32.6 % from weight of the above-mentioned sample.

The iron content of non-magnetic product is 34.5 %. It is a subject for further treatment in the next stage of the flowsheet.

It is envisaged that a production-scale device will have a form of a rotary separator.

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#### **References:**

- A.M. Turkenich: Method of wet magnetic separation of fine magnetite ores and a device for its implementation. Ukrainian Patent Application No 2000031221 (2000)

