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OPTIMIZATION OF PROCESSES GRINDING OF METAL POWDERS

The process of grinding consists in the destruction of solids by a series of mechanical influences. The process is influenced by various factors related to the properties of the material that is destroyed, the type of energy applied, the parameters of the grinder used. The end result of grinding depends mainly on the applied energy.

We now know several experimentally established laws, each of which is valid only in the field of relatively coarse dispersion. For a mathematical description of the particle size distribution, grinding products, many authors have proposed mathematical dependencies that cannot be universal.

The purpose of the robot is to build the mathematical model closest to the real process of grinding. This model will allow: to determine the optimal modes of operation of the ball mill; to predict the characteristics of the grinding products according to the known characteristics of the source material and the modes of operation of the mill. It is of interest to follow by research the change in the crushed residue depending on its amount in the mill.

Grinding is one of the main technological processes for the utilization of grinding sludge [1]. The grinding operation is a process of mechanical destruction of SHH15 steel powder particles, designed to grind the original particles as much as possible and give them a regular shape. The regulation of the grinding cycle is reduced to ensuring the maximum productivity of the mill with a given particle size distribution of the grinding class.

The results of all subsequent processing of the product depend on the qualitative and quantitative indicators of grinding, first of all, such as formation, homogeneity of properties by volume, productivity of the process of obtaining finished products.

Therefore, the object of mathematical modeling is a ball mill together with the classification process. The following assumptions have been made in the simulation: the distribution of particles in the mill and on the control sieves is uniform over the entire surface; the efficiency of classification is a constant value and does not change over time.

The algorithm for solving the mathematical model includes the definition of: the differential equation that determines the kinetics of the grinding process and the equation of material balance by mass at the stage of classification. The starting material to be ground may consist exclusively of coarse grains or of a mixture of coarse grains and the finished product.

Due to the extreme complexity of the physical picture of the process in the mill, it is impossible to predict the quantitative change in the grinding of a large class for a particular material without experiment. Therefore, the powder was subjected to dry grinding at different times in a laboratory mill. After grinding, the powder was subjected to sieve analysis.

The results of the study were used to construct grinding kinetics curves with different grinding times, which determine the grinding time of each product to a certain residue. Also graphs that show the grinding kinetics of each of the classes. Quite good coincidences of calculated and experimental data are obtained [2].

References

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2. Gal'chuk T.N., Rud' V.D. Kinetics of ball milling of powders obtained from the ball bearing the production of wastes // Powder Metallurgy.–2011. – №5/6.– P.20-26.