The high energy intensity of the bulk material grinding process explains the topicality of the problem of increasing the process efficiency in jet grinding plants. The aim of this paper is to analyze the results of investigations into the development of new approaches to the optimization of the dry fine grinding process and grinding product quality control.

Grinding product particle size distribution formation regularities and mechanism such that the required particle size is achieved with minimal energy consumption were established. A critical level of fine grinding energy intensity was found out. A scientific approach to reducing the specific power consumption in closed cycles of fine grinding was developed based on a balance and a simulation model.

A method was developed for jet grinding study based on acoustic monitoring of the grinding plant working areas. The process parameters were related to the acoustic ones, and the regularities of acoustic radiation from a jet grinding plant were determined. The use of acoustic monitoring in the determination of the particle size of bulk materials of various properties was justified. Experimental plants were developed for the in-flow analysis of the material particle size distribution. The dependence of the characteristic frequency dispersion on the particle mass and the fraction size in the mixture was established, which allows the contactless determination and prediction of the material particle size distribution in a gas flow. A grinding product quality control technique was developed and tested in industrial conditions.

Several lines of jet grinding optimization and a power consumption evaluation and prediction method were developed. The jet grinding regime visualization and identification system developed on the basis of information technologies and acoustic monitoring results allows one to choose the optimum parameters of the jet grinding process with a minimum of starting experimental data. There is a need to continue the development of an automated system that would control the jet grinding process based on the analysis of its acoustic signals.

**Keywords** acoustic monitoring, grain-size composition, quality control, jet grinding.


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