

# ADVANCED COMPUTING FOR ENERGY EFFICIENCY OF MILLING PROCESSES

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**Abstract.** In this paper is paid attention to the research of milling processes in different operational modes and simulations of grinding bodies with different shapes (spheres and spherical tetrahedrons). The simulation is made with software, which is working on the discrete elements method - EDEM Software. The influence of the shape of milling bodies on the energy efficiency of milling processes is investigated. Analysis of the results are made.

The results of experiments for milling of ore and cement in different regimes and with different grinding bodies are presented. The experiments were conducted in the laboratory "Smart lab" with using of a real laboratory mill and RELOE tetrahedron milling bodies. The critical speed of the ball mill is also defined. Mills in most cases operate at 65% to 85% of the critical speed. This study uses 75% of the critical one, which is 57 rpm. It reaches the most used mode – the cataract one.

With the help of the EDEM Software we define and simulate the impact force, the angle of separation of the shoulder and the angle of incidence (falling) in cases of different working regimes and different shape and size of the milling bodies. The total force of a selected particle is calculated.

For the energy efficiency of milling processes are important both - the quality of the milling (speed, size and consumption) as well as the energy consumption for preparing the materials (the heating and temperature distribution).

**Keywords:** milling processes, RELOE tetrahedron, ball mills