

Design of the centrifugal-gyratory mill of mining production(Article)

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#### Краткое описание

To provide the mining enterprises of Kazakhstan with a new type of mill, which has a reduced power consumption. Mining mills are the main consumers of electricity in the mining sector, so the task of reducing energy is very important. Centrifugal-gyratory mills are designed for grinding various mineral raw materials. Mills of this type have been known for a long time and have shown good results in the process, one of the main advantages of these mills is the reduced consumption of electric energy. In operational tests of this scheme, its main drawback was found to be a high probability of a driven crankshaft motion according to the unplanned law of motion, which leads to a breakdown of the mechanism. Even a small inaccuracy in the manufacture of the mechanism, backlash can lead to a gap of the driven crank with the leader, especially in the zone close to the extreme position. In this paper, the design of the centrifugal-gyratory mill based on a rocking mechanism is studied. The mill has several advantages over analogues: simplification of design, high dynamic stability, energy costs reduced by 2 times, etc. For the first time, operational testing of mills was carried out at the Scientific Research Institute of Mineral Processing of the National Center for Processing Mineral Resources of the Republic of Kazakhstan. The working principle of the mill is studied, which consists in a plane-parallel displacement of cylindrical grinding chambers-tubes in a plane perpendicular to their axis, at which each point of the grinding chamber moves along a circle with a radius equal to the length of the crank  $r$  of the mill mechanism [5]. The centrifugal force of the counterweights, the unbalanced dynamic force and moments, the force analysis are calculated. Results. It can be seen from the research results that the proposed mills have a specific capacity index of 140 kg/kW or 8 kW/ton of production. According to this indicator, the proposed mills exceed the ball mills by 2 times [3]. In this scheme, the theoretical balance of the mechanism is obtained. There are significant design achievements: there is one crankshaft, there is no excessive bonds, no need for gears, which greatly simplifies the design. The mill has high maintainability. Scientific novelty. The novelty of the results is the creation of centrifugal-gyratory mill constructions, which provide the optimum grinding process, energy intensity, metal consumption and mill productivity. Practical significance. Based on calculations and experimental data, as well as in determining its rational design and technological parameters, it was revealed that in the process of the experimental-industrial period of the mill at the polygon of the State Research and Production Association of Industrial Ecology "Kazmekhanobr" (Almaty), which is part of the National Center for Complex Processing of Mineral Raw Materials of the Republic of Kazakhstan, that the mill has a low level

of metal consumption, it has a low level of complexity structure, thereby reducing the cost of the mill compared with the ball ones approximately in 3 times, compared with existing centrifugal mills in 1.5 times. Tests of the mills showed their economy in energy consumption, which is the most important indicator. © 2018, National Academy of Sciences of the Republic of Kazakhstan. All rights reserved.