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Original version

Review of the dissertation titled "Research and development of the design of a centrifugal gyration mill for grinding ore"

This is a review of the dissertation of Arinova Dinara Bakhberovna, born on 08.11.1983 at the city of Ust-Kamenogorsk, entitled "Research and development of the design of a centrifugal gyration mill for grinding ore", presented to gain the degree of Doctor of Philosophy (PhD) in the specialty 6D 071200 - "Mechanical Engineering" at Kazakh National Research Technical University named after K.I.Satpayev, Almaty, Kazakhstan.

Currently, the market applies different types of machinery for grinding of ores. This dissertation considers the special design of a centrifugal gyratory mill, which is supposed to deliver efficient grinding due to a plane-parallel movement of grinding chambers.

The scientific work and results obtained by the author are as follows:

The introductory part is about the research and presentation of the current state of various grinding machinery. Aspects considered are design features, mathematical description of grinding processes and the process parameters involved. Main dependences of the grinding process are pointed out.

The second part analyzes the dynamics of the centrifugal gyratory mill. Depending on the machinery parameters mass and crank radius and the and operational parameter rotational frequency the kinetics of the grinding bodies inside the grinding chamber were determined. Further analysis consider the definition of counterweight mass.

The third part considers the mechanics of the crankshaft. Basing on the analysis of the starting process of the mill deformations of and stresses in the crankshaft were determined by means of experimentation and calculation. The results were taken to execute a fatigue strength calculation by means of the finite element method for the multi-cycle loading situation. As an additional result it was worked out, that the Campbell diagram shows little dependancy of the frequencies on the state of loading.

The concluding part summarizes the results of the project and points out the outcomes of the dissertation.

The dissertation delivers a review of machinery and the mathematical description of grinding processes in such machinery. The author of the dissertation conducted various theoretical and experimental research on the centrifugal gyratory mill. She took into account recognized methods of analysis and synthesis. Results of the work have been implemented in industry which allows the assessment in practice of the results provided.

The approach is organized taking into account the tasks set. Separate chapters of the dissertation are logically interconnected. The author consistently performed an analysis of the state of scientific knowledge in the field of the subject of research, carried out theoretical and

experimental studies and outlined the ways of practical implementation of the results of the work.

The author executed research and obtained results that comprise the signs of scientific novelty. The results are likely to contribute to further improvement of machinery especially with regard to durability, availability, safety and thus efficiency. This pays to the industries using such machinery like ore industries e.g.

The dissertation author conducted a broad analysis of literary sources, including normative information, administrative information and data of production structures. She published itself several articles including a recent Q3-rated Scopus publication.

My impressions I got during consultation to Arinova Dinara Bakhberovna and two internships of Arinova Dinara Bakhberovna at Technische Hochschule Georg Agricola, Bochum, Germany, during periods 08.10.2018 to 02.11.2018 and 11.06.2019 to 30.06.2019.

Presented dissertation work of Arinova Dinara Bakhberovna is a complete scientifically-qualified work that contains a solution to the applied scientific problem of selecting and substantiating the parameters of a centrifugal gyratory mill for grinding ore, which makes it possible to increase its durability, availability, safety and thus efficiency.

The thesis comprises analysis, evaluation and conclusion at the level required and is recommended for official defence.

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