

ANNOTATION

Dissertation work on a theme:

«**Research of technological methods of upgrading of making of heavily loaded of gearing of drive of ball mills**» of the degree of Ph.D. presented on a competition on speciality 6D071200 is «Machine building»

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Actuality of researches. Presently in Kazakhstan there is a row of tendencies, requiring development and modernisation of infrastructure. In the conditions of transitional period of Kazakhstan from плановой to the market economy her raw mineral-material resources acquire an exceptionally important value. In the conditions of international competition President of Republic of Kazakhstan is set the problem of diversification of home economy. Basic priority is speed-up technological modernisation of economy that puts complex tasks on development of base industries.

Large volume of mountain breeds, containing valuable minerals, processed on the ore mining and processing combines of Kazakhstan. For their growing shallow and for the further processing ball and cored mills (Balkhash, Жезказган) are used.

At ball mills, with a drive toothed crown on a drum, there is an intensive wear of points, because of heavy-duty of mill, that results in the necessity of their frequent replacement. Also there are large outages of mill. Gearing of drive of mill test intensive shock influence, that reduces, because of wear, resource of their work and mill on the whole.

Existent technologies of making of large curbing gear-wheels, by diameters to 10 000 mm., are made from raw steel without the additional tempering and tooling. Experience of the foreign use of alloyed steel and consolidating technologies of curbing gear-wheels, showed priority of these technologies, therefore scientific researches on the increase of firmness of the toothed hooking of large heavily loaded of gearing of ball mills, are, on the modern stage, actual.

Work was executed in the Kazakh national research technical university of the name К.И.Сатпаева (Алматы, Kazakhstan) and the Central institute of aviation motor-building the name of П.И.Баранова (Moscow, Russia).

The aim of work is development of technological methods of upgrading making of the heavily loaded gearing of drive of ball mills, allowing to promote longevity of gearing and resource of work of ball mill.

Idea of work increase of longevity of the toothed hooking with the use of technological methods of upgrading of making toothed hooking of drive of ball mill.

In connection with the put aim, the next tasks of researches are set forth:

- to execute the ground of basic methods of wear and treatment of toothed crown, sources of technological error and parameters of quality;
- to execute a design and research of quality of making of the heavily loaded gearing on the basis of programmatic complex "AEROFLANK" and

ground the rational parameters of profile of gearing, allowing to pass loading on points through the assured layer of greasing;

- to work out the dynamic model of **тяжелонагруженных** of gearing of drive of ball mill, the change of parameters of that will allow to bring down influence of the dynamic loading on gearing due to the damping capacity of drive billow and magnetic system of electromechanic, to decrease the wear of points of transmission the same;

- to work out NT of making of large-grain gear-wheels of drive of ball mill with the use of new materials with high-casting properties, enhanceable mechanical descriptions and rational technology of tooling with the use of ППД.

A research object is drives ore of grinding ball mills of ore mining and processing production.

The article of research is the heavily loaded gearing of drive of ball mills.

Methodological base of researches

The results of researches are got on the basis of theoretical and practical positions of technology engineer; theories of resiliency and plasticity; to the theory of wear taking into account the dynamics of gearing, and also theory of planning of experiment and statistical processing of data. Experimental researches were conducted in stand terms on an operating equipment with the use of original methodologies and modern measuring apparatus of high exactness.

The scientific novelty of work consists in the following:

- in the increase of wearproofness of gearing of drive provided by creation by the line of profile of points, at that the points of transmission contact only through the layer of greasing along the whole length of line of hooking, with the use of the system of direct synthesis of gearing in the program AEROFLANK;

- decline of influence of the dynamic loading on gearing provided by the change of parameters of the worked out dynamic model of **тяжелонагруженных** of gearing of drive of ball mill, damping the capabilities of drive billow and magnetic system of electromechanic, that promotes reduction of wear of points of transmission;

- calculation of tireless durability and prognostication of longevity of toothed crown of drive of ball mill, provided by means of the module of MSC/Fatigue in the environment of NASTRAN;

- in NT of making of large-grain gear-wheels of drive of ball mill with the use of ligating сталей, by high-casting properties and enhanceable mechanical descriptions, also by rational technology of tooling with the use of ППД and new consistency of lubricating material.

On defence next substantive scientific provisions dart out:

- to recommendation on the use of the system of direct synthesis of gearing in the program AEROFLANK, allowing to find such line of profile, at that the points of transmission contact only through the layer of greasing along the whole length of line of hooking, that promotes wearproofness of gearing of ball mill;

it is the built dynamic model of the heavily loaded gearing of drive of ball mill, the change of parameters of that will allow, to bring down influence of the dynamic loading of ball mill on gearing due to the damping capacity of drive

billow and magnetic system of electromechanic, to decrease the wear of points of transmission the same;

it is NT of making of large-grain gear-wheels of drive of ball mill with the use of new materials with high-casting properties and enhanceable mechanical descriptions and rational technology of tooling with the use of ППД and new consistency of lubricating material.

Theoretical meaningfulness of work consists in the increase of resource of exploitation of ball mills due to perfection of technology of making of gearing of drive of ball mills, with the use of alloyed steel, possessing high fluidity, saves high hardness during exploitation.

Practical meaningfulness of work consists in the following:

- in the increase of wearproofness of gearing of drive provided by creation by the line of profile of points, at that the points of transmission contact only through the layer of greasing along the whole length of line of hooking, with the use of the system of direct synthesis of gearing in the program AEROFLANK;

- decline of influence of the dynamic loading on gearing provided by the change of parameters of the worked out dynamic model of the heavily loaded gearing of drive of ball mill, damping the capabilities of drive billow and magnetic system of electromechanic, that promotes reduction of wear of points of transmission;

- the calculation of tireless durability and prognostication of longevity of toothed crown of drive of ball mill is executed, provided by means of the module of MSC/Fatigue in the environment of NASTRAN;

- in NT of making of large-grain gear-wheels of drive of ball mill with the use of ligating steel, by high-casting properties and enhanceable mechanical descriptions, also by rational technology of tooling with the use of ППД and new consistency of lubricating material;

it is the expected annual economic efficiency of introduction of technology of making of toothed crown of drive of ball mill, will make 17 700 000 roubles.

Dissertation work was executed in accordance with the innovative project of department "Standardization, certification and technology of engineer" № 757. MOH. ГФ. 15.EM.5 «Development of design-engineering methods of increase of wearproofness of the heavily loaded gearing of drive of ball mills».

Validity and authenticity of scientific positions, conclusions are set:

- by the analysis of high-cube of productive data and empiric materials on the ore mining and processing combines of Kazakhstan, Ukraine, Russia on exploitation of ball mills;

- by the use of substantive provisions and methods of technology of engineer, theoretical mechanics, theory of resiliency and plasticity and decision of tasks on ПЭБМ;

- by realization of mathematical design and experimental laboratory researches of technological parameters of wearproofness with the decision of tasks on ПЭБМ;

- by establishment of convergence of results of theoretical and experimental researches.

Realization of job performances

Dissertation job performances were inculcated on propulsion MODULE the Petropavlovsk plant of heavy engineering (ПЗТМ) (Petropavlovsk, Kazakhstan), and also at the plant of propulsion MODULE "Карданвал" (Чимкент, Kazakhstan), ТОО "Scientifically-promotional center "Алмас" (Алматы, Kazakhstan). Results scientifically research work inculcated in an educational process at preparation of bachelors and магистрантов on specialities 5B071200 is "Engineer", 5M071200 is "Engineer" in КазНИТУ of the name К.И. Сатпаева (Алматы).

Approbation of work. The substantive provisions of dissertation and research results were given a report and came into question on XXII of the International scientific and technical conference "Engineer and technosphere of the XXI century" (Russia, Sevastopol, 2015); on XII of the International in absentia conference "Development of science is in the XXI century" (Ukraine, Kharkiv, 2016), at International research and practice conference sanctified to memory of corresponding member КазАСХН, д.т.н., professor of Тулеуова Е.Т. "Innovative approaches and technologies for the increase of efficiency of productions in the conditions of global competition" (Kazakhstan, Families, 2016), on XII of the International scientific and technical conference "Vibration - 2016" (Russia, Kursk, 2016) on the International Сатпаевских reading "Scientific heritage of Шахмардана Есеновая", (Kazakhstan, Алматы, 2017).

Publications. Basic dissertation job performances are published in the 13 published works, including 3 articles in magazines, recommended ККСОН МОН of РК; 8 publications in the International conferences, from them 6 - foreign; a 2 article is published in a magazine, included in the database of Scopus.