

## **ESTABLISHMENT OF THE DEPENDENCE OF THE COEFFICIENT OF FILLING WITH BALLS FOR DRUM MILLS ON THE POWER CONSUMPTION IN ORDER OF ITS DETERMINATION DURING MOTION**

**Ivan Minin**

*University of Mining and Geology „St. Ivan Rilski”, 1700 Sofia, minin@dir.bg*

**ABSTRACT.** The coefficient of filling with balls of the drum of ball mills is a key parameter. It depends on the basic technological parameters of drum ball mills such as relative energy consumption per unit of product, relative productivity, yield of estimated fraction, circulating load and others. Due to the constant abrasion wear of drum linings and of the balls themselves, as and the addition of new ones, it changes and it is necessary to be measured and controlled. Its measurement most frequently is during a cessation of operation of the mill and this can not be done often for some technological and economic reasons. This problem does not exist in modern mills that are equipped with load cell. This article shows the way of analytical determination of the coefficient of filling only through measurement of the power for the mill engine with no need to stop the facility.

**Keywords:** mill, relative speed, coefficient of filling, ball load.

## **CONCERNING ON RESOURCE ASSESSMENT OF BUCKET WHEEL EXCAVATORS**

**Petko Nedyalkov<sup>1</sup>, Ivan Minin<sup>2</sup>, Simeon Savov<sup>3</sup>**

<sup>1</sup> TU – Sofia, Faculty of Mechanical Engineering, dept. MENK, nedpetko@tu-sofia.bg

<sup>2,3</sup> UMG "St. Ivan Rilski" – Sofia, FMEM, dept. MM, <sup>2</sup> minin\_ivan@abv.bg, <sup>3</sup> ss.ss@abv.bg

**ABSTRACT:** This paper deals with some formulations in resource assessment for metal constructions of a mine bucket wheel excavators and with some formulations in method of a resource assessment. There are examined the base indices describing dynamical load in metal construction. There are research some differences in assessment based on averaged annual rating, on productivity and on net working time.

**Keywords:** steel frame metal construction, resource assessment, dynamical load

## **DETERMINATION OF THE GEAR RATIOS IN THE AUTOMATIC GEARBOX OF AN OPEN PIT DUMP TRUCK**

**Hristo Sheiretov**

*University of Mining and Geology "St. Ivan Rilski" Sofia, sheiretov@abv.bg*

**ABSTRACT.** The elements of the transmission of an articulated dump truck are described: the diesel engine, the hydromechanical automatic gearbox, the drive axels with main gears, differential gearboxes and wheel planetary gears. The number of speeds of the gearbox is determined. On the basis of the maximum drive speeds of the truck the gear ratios of the gearbox are determined. The formulas for the determination of the gear ratios for the forward and reverse speeds are obtained. On the basis of these formulas the gear ratios of the gearbox are determined. A concrete example is calculated for the dump truck TEREX A340 with capacity 36,5 t.

## **EXAMINATION OF THE INFLUENCE OF DIFFERENT FACTORS ON THE ROLLERS LOADING OF A BELT CONVEYOR**

**Hristo Sheiretov**

*University of Mining and Geology "St. Ivan Rilski" Sofia, sheiretov@abv.bg*

**ABSTRACT.** The design of the rollers is described and the formulae for the determination of the static and dynamic load of the idlers and the rollers are given. The influence of the belt velocity, the number and the length of the rollers in the idlers, the angle of inclination of the side rollers and the mass of the material lumps on the rollers loading is examined. The following conclusions are made: with the increase of the belt velocity at constant conveyor capacity the rollers loading is decreased; with the decrease of the number of the rollers in the idlers at a constant conveyor capacity the rollers loading is decreased; with the decrease of the length of the center roller in three and five roll idlers at a constant conveyor capacity the loading of the center roller is decreased and rollers with lower capacity can be put in the idler sets; with the decrease of the mass of the material lumps the rollers loading is decreased.

## STRUCTURIZATION AND UNIFICATION THE SYSTEM OF JAW CRUSHER BASIC ELEMENTS

**Kristian Cvetkov<sup>1</sup>, Julian Dimitrov<sup>2</sup>**

<sup>1</sup> University of Mining and Geology "St. Ivan Rilski", Department of Mining Mechanisation, 1700 Sofia, [khc@mgu.bg](mailto:khc@mgu.bg)

<sup>2</sup> University of Mining and Geology "St. Ivan Rilski", Department of Mathematics, 1700 Sofia, [juldim@abv.bg](mailto:juldim@abv.bg)

**ABSTRACT.** In the paper is presented a graphical system of jaw crusher's basic elements that is designed for educational purposes. With the method of Learning Manifold is built semantic model of the jaw crusher constructions. Additionally the model contains language for symbolic description of these machines as assembled unit. It was structured the system of jaw crusher basic elements with educational purposes. Teaching software for graphic interpretation of jaw crusher schemes is presented.

**Key words:** jaw crushers, jaw crusher schemes, method of Learning Manifold, symbolic description, graphical system

## GEOMETRIC MODELLING AT OPTIMIZATION OF JAW CRUSHERS PARAMETERS

**Julian Dimitrov<sup>1</sup>, Kristian Cvetkov<sup>2</sup>**

<sup>1</sup> University of Mining and Geology "St. Ivan Rilski", Department of Mathematics, 1700 Sofia, [juldim@abv.bg](mailto:juldim@abv.bg)

<sup>2</sup> University of Mining and Geology "St. Ivan Rilski", Department of Mining Mechanization, 1700 Sofia, [khc@mgu.bg](mailto:khc@mgu.bg)

**ABSTRACT.** In the article applies an effective method to study and design of technical objects that combines analytical modeling with graphical interpretation. Graphical modeling is performed by means of multidimensional descriptive geometry. An appropriate hypersurface in the parameters configuration space is built. Application of the method can be automated by a computer graphics program for the graphic descriptive decision and corresponding numerical results.

**Keywords:** jaw crushers, multidimensional descriptive geometry, descriptive graphic solutions

## INTENSITY OF WEAR OF THE BRACELET IN THE MINE LOCOMOTIVES FOR UNDERGROUND TRANSPORTATION

**Lyuben Tasev**

University of Mining and Geology "St. Ivan Rilski", 1700 Sofia

**ABSTRACT:** Wear is the process of dimensional change of details in result of friction. Wear of the bracelet is a resource determinant of the whole locomotive, hence the transport scheme of the mine. The article examines the main factors determining the intensity of wear of the bracelets of underground mine locomotives.

## ARRANGEMENT OF PLASTIC DEFORMATIONS IN TUBE, LOADED BY INTERIOR FORCE

**Nikolai Dinev<sup>1</sup>, Raina Vucheva<sup>2</sup>, Violeta Trifonova-Genova<sup>3</sup>**

<sup>1</sup> „Mini Maritsa Iztok” EAD, [nick@marica-iztok.com](mailto:nick@marica-iztok.com)

<sup>2,3</sup> University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, <sup>2</sup> [r.wutschewa@abv.bg](mailto:r.wutschewa@abv.bg), <sup>3</sup> [violeta.trifonova@yahoo.com](mailto:violeta.trifonova@yahoo.com)

**ABSTRACT:** The article examines specific knife bucket of SRS 4000. There have been determined the amounts of computing scheme as a spatial framework. In designing and constructing of a new bucket is necessary to offer two types of asymmetrical loading on the teeth of the blade. It is decomposed by the axes of the cross section of the frame. To proceed with the implementation of the power method it is necessary the cross section of the knife to be permanent. For this purpose, a method of bringing the linearly variable cross-section of the blade in a constant within certain sections is described. In these portions are obtained geometrical characteristics of the cross section.

**Keywords:** knife in a bucket, load, spatial framework.

## STUDY ON THE STRESSED STATE OF KNIFE BUCKET

**Nikolai Dinev<sup>1</sup>, Raina Vucheva<sup>2</sup>, Violeta Trifonova-Genova<sup>3</sup>**

<sup>1</sup> „Mini Maritsa Iztok” EAD, [nick@marica-iztok.com](mailto:nick@marica-iztok.com)

<sup>2,3</sup> University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, <sup>2</sup> [r.wutschewa@abv.bg](mailto:r.wutschewa@abv.bg), <sup>3</sup> [violeta.trifonova@yahoo.com](mailto:violeta.trifonova@yahoo.com)

**ABSTRACT:** The article carried a three-dimensional analysis to determine stress state knife in a bucket of SRS 4000. Based on an analysis of the embodiment of this bucket is justified computing scheme in the form of a broken frame. For the needs of the adopted method of calculating the framework described approach to bring the spatial task into two tasks: "type flat" and "type plain space." The result of the analysis gives grounds to proceed with using the described approach in future work.

**Keywords:** knife in a bucket, stress state, circular tube, plain frame.

## TESTING THE NOISE AND VIBRATIONS OF KRAZ-2516 VEHICLES IN ASAREL MEDET MINE

**Yuri Ivanov<sup>1</sup>, Svetlozar Tokmakchiev<sup>2</sup>**

<sup>1,2</sup> University of Mining and Geology "St. Ivan Rilski", Bulgaria, e-mail: <sup>1</sup> [ohio@abv.bg](mailto:ohio@abv.bg), <sup>2</sup> [tokmak@yahoo.com](mailto:tokmak@yahoo.com)

**ABSTRACT.** The noise and vibrations in the cabs of lorries «KRAZ-2516» are discussed. The drivers of these lorries are subjected to continuous vibro-acoustic effects, which greatly reduces their performance. The purpose of the research is to establish the their actual level and propose measures to reduce harmful impacts.

## **IMPLEMENTING A SYSTEM FOR OVERCURRENT PROTECTIONS WITH A COMBINED LOGIC AND DIRECTIONAL DISCRIMINATION IN MV DISTRIBUTION SYSTEMS AT AURUBIS BULGARIA**

**Stefan Chobanov**

*CMC-C Ltd, Pirdop, e-mail: stefan.chobanov@cmc-c.com*

**ABSTRACT:** It is designed a system with overcurrent protections with a combined logic and directional discrimination, which is implemented in Aurubis, within a one-year program for the retrofit MV distribution systems. The system is mainly based on digital protection devices type Sepam. In the report are analyzed the results of experimental studies that underpin the design and implementation of the system. Functionally-structural scheme of the system and Timeline of its work is synthesized.

**Keywords:** digital protection, logic discrimination, directional protection

## **PROBLEMS THAT OCCURS AT THE PRIMARY COMMUTATION IN THE RECONSTRUCTION OF SWITCHGEARS**

**Stefan Chobanov**

*CMC-C Ltd, Pirdop, e-mail: stefan.chobanov@cmc-c.com*

**ABSTRACT:** Renovation of LV and MV switchgears through retrofit is applied widely in the industrial systems with proven technical and economical efficiency. In the cases where the commutation equipment is replaced, most often requires changes in the construction of the busbar system in the switchgear. The article offers a methodology for selecting the busbars in the primary commutation of the switchgear by criteria for heating and electrodynamic resistance in the established regime and in short circuit regime.

**Keywords:** retrofit, busbars, electrodynamic resistance

## **STUDY ON THE PROTECTION TO EARTHINGS IN HIGH VOLTAGE INSTALLATIONS WITH GROUND-ISOLATED NEUTRAL POINT**

**Vlad Mihai Pasculescu, Nicolae Ioan Vlasin, Marius Cornel Suvar, Daniel Florea**

*National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 332047 Petroșani, Romania; vlad.pasculescu@insemex.ro; nicolae.vlasin@insemex.ro; marius.suvar@insemex.ro; daniel.florea@insemex.ro*

**ABSTRACT.** In high voltage electrical networks which operate with ground-isolated neutral point the state of the insulation resistance to earth has to be permanently tested because of the following reasons: i) Single-pole earthings do not lead to short-circuits so that they will not be disconnected from the protections using over relays from the rigging of high voltage cells; ii) Single-pole earthings as well as phases insulation faults to earth lead to the occurrence of leakage currents (sneak currents) which may lead to spontaneous detonation of electrical detonators which can cause electrocutions, fires and explosions that often have catastrophic effects. The paperwork presents the methods for insulation resistance testing and the means of protection to earthings in high power electrical networks.

**Key words:** insulation resistance, high voltage, protection to earthings, zero-sequence component

## **STUDY OF THE EFFICIENCY OF LEDS**

**Krasimir Velinov**

*University of Mining and Geology "St. Ivan Rilski", candela@mail.bg; http://light-bg.eu*

**ABSTRACT.** The report examines the impact of electrical and lighting parameters of LED modules consisting of single and COP LED by different modes. Change was detected in light efficiency of 170 to 200 lm/W, depending on the current loading.

**Keywords:** LED lighting, light output

## **WEB-BASED DATABASE FOR LUMINARIES**

**Krasimir Velinov, Svetlana Velinova**

*University of Mining and Geology "St. Ivan Rilski", candela@mail.bg; http://light-bg.eu*

**ABSTRACT:** The report describes the created in the laboratory "Lighting" database of about 2000 luminaries measured over the period 2011-2016 year. The database contains information about electrical and lighting parameters accordingly issued over the years protocols. An analysis of developments in technology over time and the influence of the parameters of the light sources on the efficiency of luminaires is made.

**Keywords:** lighting, WEB database

## **EVALUATION EFFICIENCY PHOTOVOLTAIC MODULES IN CONTINUOUS SERVICE**

**Rumen Istalianov<sup>1</sup>, Nikolay Lakov<sup>1</sup>, Ventsislav Spasov<sup>1</sup>**

*<sup>1</sup>University of Mining and Geology "St. Ivan Rilski", Sofia, Republic of Bulgaria, E-mail rgi@mgu.bg*

**ABSTRACT:** The report presents and analyses the results of research efficiency photovoltaic modules BP Solar for 17 years in Laboratory of Renewable Energy, University of Mining and Geology "St. Ivan Rilski".

**Keywords:** cells performance warranty, PV module efficiency, photovoltaic modules, solar irradiance

## **INVESTIGATION OF A CURRENTS VIA SINGLE-PHASE GROUNDED CONNECTION IN ELECTRICAL POWER SUPPLY SYSTEMS FROM THE MOBILE SUBSYSTEMS OF “MINI MARITSA IZTOK” EAD**

**Todor Varbev**

*University of Mining and Geology “St. Ivan Rilski”, 1700 Sofia, vat@mgu.bg*

**ABSTRACT:** The article deals with an analysis of electrical power supply networks from the mobile subsystems of “Maritza East Mines” Ssc. The current via single - phase grounded connection is determined and investigated. This study is a base of the design for working mode of the stellar center of each main transformer in the power supply networks.

## **AN ANALYSIS OF THE ELECTRICAL SAFETY CONDITIONS DURING A MAINTENANCE OF THE ELECTRICAL POWER SUPPLY SYSTEMS FROM THE MOBILE SUBSYSTEMS OF “MINI MARITSA–IZTOK” EAD**

**Todor Varbev**

*University of Mining and Geology “St. Ivan Rilski”, 1700 Sofia, vat@mgu.bg*

**ABSTRACT.** This article deals with an analysis of the electrical safety conditions in the electrical power supply networks from the mobile substations of “Maritza-East Mines” Ssc. The maximal length of the cable system is determined. The additional parameters such: the value of current via single - phase grounded connection and maximum value of the switch –off time for the line trouble are obtained.

## **APPROXIMATE METHOD FOR DETERMINATION OF ENGINE POWER OF JAW CRUESHERS FOR COARSE**

**Teodora Hristova**

*University of Mining and Geology “St. Ivan Rilski”, 1700 Sofia, teodora@mgu.bg*

**ABSTRACT.** Often second hand jaw crushers with missing engine and documentation are delivered to mining and construction companies. In such cases it is necessary employees without qualification in the field of mineral processing machines to determine which engine is required for the machine in respect of the specific properties of the material for crushing. Belt pulleys and distance between axes help to define the engine speed, but the calculation of its power requires qualifications in the field. This article is an attempt to facilitate the way to determine the required engine power without necessity of additional staff training. Here are discussed two of the most popular methods for determination of the power of these machines and the more appropriate one is chosen. On this basis is established a schedule, on which the problem can be easily solved, and finally the methodology is tested and it shows its relevance.

**Keywords:** jaw crusher, power, first stage crushing

## **TEST MODEL FOR OPERATION AMPLIFIER RESEARCH**

**Mila Ilieva-Obretenova**

*University of Mining and Geology “St. Ivan Rilski”, 1700 Sofia, milailieva@abv.bg*

**ABSTRACT.** The paper represents test model for research of operation amplifier. Methods for test model elaboration are described. Results are given by data and charts. The modern measurement instruments allow data retaining in different formats and processing with appropriate editors. Advantages of test model are listed. The future work includes simulation of operation amplifier in MultiSim environment and comparison the results of both measurements.

## **DIMENSIONAL INSPECTION OF BRIDGES BY USING THE LIMNIMETRIC KEY**

**Lorand Toth, Angelica Călămar, George Artur Găman, Sorin Simion, Marius Kovacs**

*National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 332047 Petroșani, Romania; lorand.toth@insemex.ro; angela.calamar@insemex.ro; artur.gaman@insemex.ro; sorin.simion@insemex.ro; marius.kovacs@insemex.ro*

**ABSTRACT.** Designing and building a bridge requires caring out hydraulic calculations, in this respect, topographical, hydrological, geotechnical studies and forecast data on riverbed and water levels being necessary. Bridges are located, if possible, in a stable and straight portion of the river, avoiding confluence or ramification areas, and, if necessary, corrections to stabilize the riverbed will be taken into consideration. Sizing bridges is performed in a manner that allows maintaining the capacity to evacuate large amounts of water, by avoiding the emergence of hydraulic resistance. According to effective national legislation for surface water crossings (bridges, pipelines, power lines etc.) acquiring permits from Romanian Waters National Administration is required, in order to ensure minimum height of the over crossing. This requires some calculations concerning water flows, areas of different flow sections and hydraulic radius to obtain the limnimetric key using the graphic representation of the relation between water levels and flows for a given section. To this end, the article aims to analyze the dimensional variation of water’s free surface as well as the variation of flow section as to avoid the dangers of hydraulic overload which may occur in case of floods or high flows.

**Keywords:** water level, limnimetric key, over crossing, hydraulic radius

## AN AMPLIFICATION TO SCATTER DIAGRAMS IN MS EXCEL

**Mariana Trifonova<sup>1</sup>, Lina Draganova<sup>2</sup>**

<sup>1</sup> University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, trifonova.m@gmail.com

<sup>2</sup> student, lin4eto23@yahoo.com

**ABSTRACT.** MS Excel is one of the most popular products aimed at storage, proceeding and graphic presentation of information in the form of tables. The results of engineering works are often represented in Excel as Scatter diagrams. Despite the large functionality of the product, Excel's object model doesn't offer incorporated instruments for obtaining of numeric information from an interpolating curve out of the nodes. The present report offers comparison between various interpolation methods applied to results from studies. An add-ins *Interpolation* developed for Excel by authors is represented as well. It makes possible for the coordinates of any point of the smoothing Scatter diagram's curve to be found.

**Keywords:** MS Excel, Scatter diagram, interpolation, approximation, cubic splines, Akima splines

## ANALYSIS OF THE MOTION OF A MECHANICAL SYSTEM WITH TWO DEGREES OF FREEDOM IN MATRIX FORM

**Asen Stoyanov**

University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, e-mail: asen\_dragomirov@mail.bg

**ABSTRACT:** Determined is an example related to research the motion of a mechanical system with two degrees of freedom. The survey was carried out in two different ways - the general equation of dynamics and Lagrange equation of the second order. For the first way are used two possible speeds - carrying  $v_1$  and relative  $v_{2r}$ . The second way to generalized coordinates are used absolute  $S_1$  and the relative displacements  $S_{2r}$  body 1 and body 2 and the corresponding generalized forces  $Q_1$  and  $Q_2$ . In the second way are used for summarized coordinates the absolute displacement  $S_1$  of the body 1 and the relative displacement -  $S_{2r}$  of body 2, as well as their respective summarized forces  $Q_1$  and  $Q_2$ . The final decision is realized in matrix form with the package MathCAD.

## RESOLVING THE STATICALLY DETERMINATE THREE DIMENSIONAL TRUSSES IN A MATRIX FORM

**Asen Stoyanov**

University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, e-mail: asen\_dragomirov@mail.bg

**ABSTRACT:** The spatial trusses are used not only in construction but also in the mechanical engineering. The application of computer technology for static study of spatial constructions in particular trusses, provides a compact recording partial or full automation and rapid realization of the computing process for determining the efforts in the rods. The task associated with the equilibrium of a spatial truss is not dealt in modern courses on theoretical mechanics and considering the actuality of the problem for in this an article by means the matrix algebra and the mathematical package MathCAD is solved nodal loaded with concentrated forces spatial statically determinable truss.