

ABSTRACTS

Jerzy Bajkowski

Simulations and tests of absorption and dispersion processes in MR fluid dampers

Presented paper presents some research, structural and operational problems of dampers and shock absorbers designed on the basis of MR fluid. The most important informations related to modelling and mathematical description of selected, characteristic for considered construction, phenomenon are discussed.

Aneta Bohojło, Mirosława Kołodziejczyk

Computational analysis of local thermal comfort factors in a habitable room

This work investigates local thermal comfort factors (dry resultant temperature, relative humidity, draught rating, predicted percentage of dissatisfied caused by warm or cold floor, predicted percentage of dissatisfied from vertical air temperature difference between head and feet) via numerical analysis of a natural ventilation problem in a habitable room with ANSYS-CFX. Emphasis is placed on determination of numerical uncertainty in the results.

Stefan Bućko, Henryk Jodłowski

Initiation of plastic strains in steel with physical yield point in conditions of stress gradient

The work contains tests approaching to determine the proof stress corresponding to the beginning of plastic deformations in elongated shields with holes of different diameters. Additionally, the profile and way of flow zone propagation near the hole was determined. In the tests, the authorship method of plastic strain identification based on monochromatic light optical interference effect was used. The method was presented on the example of static tensile test of the specimen made of NWC steel. The photographic documentation of the growth of plastic deformation zone for example hole and comparison of the proof stress values for different hole diameter-width of elongated shield ratios were presented.

Jan Burcan, Anna Sławińska, Radosław Bednarek

Experimental research on factors that change conditions of aiding by the magnetic field

The study presents the results of magnetic induction measurements in the vicinity of front ends of high-energy magnets as well as the results of forces between two magnets measurements. It has been proved that the distribution of the induction vector is influenced by accuracy of magnets execution and mounting. The knowledge of the course of the induction vector variations as the function of geometry and material parameters enables to determine precisely the variation of the repulsion force value of the co-operating magnets, thus will be helpful when designing pairs unloaded by means of the magnetic field, e.g. bearings or slides.

Włodzimierz Choromański, Jerzy Kowara

Application MBS technique to tests and simulations of rapid transit vehicles

The paper are focused on issue concerning the dynamics of PRT vehicles. The MBS method is applied for analysis of the vehicle. The selected results are presented.

Jarosław Czaban, Dariusz Szpica

The didactic stand to test of spring elements in vehicle suspension

In the didactic stand in work was introduced was ST1 to investigation of elements of springy suspensions vehicles as well as the computer programme was presented to identification of parameters of stiffness as well as the internal friction of studied elements.

Leon Demianiuk

Test of forces appearing in the matrix of snail briquetting device

The article demonstrates tests of momentum and forces appearing, while briquetting crumbled materials of plant origin in a snail briquetting device. Tests were run on an especially constructed stand. Results can be used for construction calculations of snail briquetting device.

Zdzisław Gosiewski, Mirosław Kondratiuk, Piotr Kłoskowski

Current control in the electric circuit of the coil magnetic launcher

In this paper the conception of current control in the electric circuit of the coil magnetic launcher is presented. The implementation manner of the regulation system was proposed and electronic component of the electric circuit were modelled. The system of the object and the impulse regulator was simulated. When the coil was energised by discharging capacitor, the controller stabilised circuit current value. The appropriate frequency of the regulator work was obtained by the means of simulation. Research was conducted for different values of the coil inductance. Thus we checked control system correctness for the variable model parameters. The analysis of the simulation was conducted and its results were depicted. Described investigations state preliminary steps of designing and building of the coil magnetic launcher experimental model with stabilized armature acceleration.

Jerzy Ickiewicz

Calculation of the un-finned end caps of the pressure vessels flat

In the article an analytical method of the cylindrical pressure vessels end caps calculation has been compared with suggested finite elements numerical technique in a context of the calculation procedures which are proposed by Urząd Dozoru Technicznego.

Marek Jalbrzykowski, Jerzy Nachimowicz

The problems of reliability and durability of tools for the injection of plastic materials

At work there are presented results of material analysis of selected mechanical properties of the tools used for plastic injection. There were used the elements of the injection moulding tool used in production process at the company Bianor Sp. z o.o. The basis of the checkout was premature consumption of the tool and loss of its efficiency. The attention was paid to changes in the observed mechanical properties and premature cracks and possibilities of physical and chemical modification of the surface of the checked parts.

Jarosław Kaczor, Andrzej Raczyński

The effect of work surface shape of the rolling bearings on durability of three-support shaft

The ball bearing durability depends on some constructional, technological and exploitation features. Among the constructional features, the one of the most essential is the osculation factor. It is defined as a relation between transverse radius of race and ball radius. Osculation factor determines the race shape, so one can see this factor as a coefficient of working surface shape. The effect of osculation on the durability of single ball bearing, loading by radial force, is well-known. The aim of this work is the determining of this effect in the case of three-support bearing arrangement, in which the interaction between three bearings occurs.

Roman Kaczyński, Adam Kłos

Analysis of transition processes with boundary lubrication as a protection mechanism against scuffing

The application of computer aided multi-parameter visual observation and recording method for the analysis of construction materials makes it possible to compare and investigate the transition phenomena from normal friction to scuffing. The method is also very essential to predict actual conditions of scuffing development. The investigations involved both the qualitative and quantitative analysis of the investigated surface layer. The paper shows an existence of a transition stage from normal /oxidation/ wear to scuffing for the analyzed bearing alloy Ł6. A small wear increase of friction elements was observed in the transition period. However, the wear intensity was found to be growing significantly with an appearance of degenerative wear forms.

Zbigniew Kamiński

Dynamic calculations of pneumatic relay valve

The article deals with some dynamic equations of relay valve used in vehicles pneumatic brake systems. The relay mathematical model was used to simulate transition processes in a pneumatic two-circuit drive with one-acting cylinder in Matlab-Simulink. The introduced method of dynamic counts of the system may be used to select design parameters of elements with regards to the requirements and operation speed of pneumatic brake system.

Ludwik Kania, Szczepan Śpiewak

Multiplication factor of double-row ball slewing bearings

A problem of multiplication factor of double row ball slewing bearings have been presented in this article. This factor is used for the determination of analytical profile of the static load capacity of slewing bearing with double-row ball based on the profile of slewing bearing with single-row ball with similar parameters. The profile of the static load capacity of modeling bearings and the value of multiplication factor has been determined. Concluding results have been obtained in numerical way.

Waldemar Karaszewski

Surface cracks of ceramic rolling elements

Zirconia is one of the most important ceramic materials for bearing applications (high speeds, different environments). The main problems connected with fatigue life are ring crack defects as the effect of manufacture or defects due to material structure. These defects decrease the rolling contact fatigue considerably. An experimental study of ring cracks propagation of zirconia ZrO₂(MgO) was described in the paper. The rolling contact tests were performed on pre-cracks zirconia upper ball using a modified (rolling lower balls) four-ball machine in specified lubricant. Ball surfaces and failures were examined using scanning electron microscopy.

Maciej Krasieński, Andrzej Trojnecki

Numerical analysis of leak tightness of metal high-pressure „2-delta” gasket

The paper deals with the numerical analysis of leak tightness of the closure with metal high-pressure “2-delta” gasket. The compression at the contact surface between the hardened gasket and deformed edge of the seat and the width of this surface are adopted as the criteria of leak tightness. Certain practical procedures applied in projects and operation of high-pressure closures with “2-delta” gaskets are verified. The FEM results are compared with the results of the analytical approach based on the simplified computational model of the contact, which can be used in engineering calculations of the gaskets.

Stanisław Krawiec

Analysis of the influence of pulley diameter and belt section on the values of indexes characterizing v-belt transmissions

In the paper the results of analysis of the influence of geometrical features of belt pulley on the value of four indexes characterizing v-belt transmissions were presented. Three different v-belts denoted as A, B and C and the driving wheel diameter with standardized values within the range 112 – 180 mm were analyzed. Structural calculations of the v-belt transmissions were carried out using computer program described in Krawiec (1991). Graphical results of the analysis and conclusions were presented.

Eugeniusz Mazanek, Marek Krynke

Distribution of internal load in the double-row ball bearing slewing rings

The article describes the numerical method to define distribution of internal bearing load. It also presents forces distribution of the bolts used to mount the bearing to support components. In this solution various flexibility of the open ring girder with local stiffening which result from its fixing on flexible support structure were taken into consideration.

Edward Mundzia, Ryszard Wójcicki

The work density of the friction and the wear of journal bearing sleeve material

This paper presents the results of investigation into the wear linear intensity I_w and the density (energy) of friction e_k^* [J/m³] that were determined by means of experimental-analytical method. The investigations were carried out for different materials of sleeves. Two methods were applied to the wear measurement, i.e. by measuring the roundness in four cross-sections of sleeve as well as by the measurement of the mass before and after the operation in the conditions of mixed friction. The results are given in the form of tables and diagrams.

Jerzy Nachimowicz, Rafal Piesiecki

Applying computer methods to design frames of replicas of cars – dynamic calculations

Very important thing at the frames design are dynamic tests, particularly analysis of own oscillations of the frame and simulations Crash-tests. Own oscillations of the frame is an essential element, which one should be analyse while constructing. Own oscillation depends on design features of the frame. Com-puter simulations of Crash-tests are being conducted to the purpose evaluations of the resistance of the car to the collision and abilities of the vehicle to protect passengers. Thanks to information get from research, it is possible to find weak points of the structure and modify to raise the safety of passengers while con-fronting.

Jerzy Nachimowicz, Rafal Piesiecki

Applying computer methods to design frames of replicas of cars - static calculations

The frame is one of the most important components of the structure of replicas, on which is usually made up of body-work made of composites. Frames is responsible for transferring all charges and the passive safety of users of the car. The basics to correct functioning of the entire vehicle is correct designing the frame. The method which was used to calculations is MES. For this model, endurance calculations were conducted with static loads and loads which are a result of exploitation the vehicle.

Henryk G. Sabiniak, Robert Cichowicz

Limitations in application of empirical formulas to design of worm gears

Worm gears owe their popularity to their compact structure, large ratios at one degree, silent run, smooth driver transmission and relatively great durability. They have additional quality of simultaneous performing the role of brakes in reversible movement and transferring motion in one direction. All these advantages apply to worm gears working as reducers. Worm gears working as multipliers are extremely rare. They are usually used for transfer of motion as elements of kinematics.

Tadeusz Smolnicki, Mariusz Stańco

Forecasting of the plastic wear in large size rolling bearings with soft raceways

Plastic wear of large-size roller bearings with the unhardened raceways is a dominating mechanism of the wear. Forecasting the speed of wear at the stage of machine design is essential. On the basis of material testing and advanced simulations with use of finite element method a bilinear model was inserted, of which constants depend on parameters of material and loading the bearing. Models were used for forecasting the durability of bearings, which the plastic wear was dominated in.

Dariusz Szpica, Jarosław Czaban

The stand to investigations of injectors of fuel from petrol supply

The article presents to investigations of injectors the position with petrol arrangements the the power supply. The inappropriate work of injector, both under of quantity, as and it is effective the quality of injected fuel the unequal work of engine and the growth of emission of toxic components fumes. Therefore essential the possibility of delimitation of mass of injected fuel is in count on one cycle, as the delimitation the equableness of dosage also.

Michał Śledziński

Experimental verification of the design of vibration isolator for soil compacting tool

The results of vibration activity study of the tool for soil compacting are presented. The displacement and acceleration of the ram and tool handle are investigated. The performed measurements showed that occurring vibration of the tool handle considerable exceed the admissible value, what caused the necessity of the use of vibration isolator. The construction of the damper's prototype lowering vibration level transmitted to the hand-arm-operator system was made. Introduction of two-stage vibration isolation system of the tool makes possible significant lowering of vibration transmission to the operator's body without decreasing the effectiveness of the technological process. The projected vibration isolator became confirmed in the experimental verification.

Wojciech Tarasiuk, Bazyli Krupicz

Analysis of materials of plates forming the lime-sand brick mould

The analysis of properties of the materials used to prepare the plates lime brick form was presented. The plates produced by two different companies were studied. Based on micrography, the mechanism of plate wear was described. During the process of material loss, processes of furrowing and micro-cutting dominated. After the study of plate core hardness, its surface micro-hardness and chemical constitution it was concluded that both plates were made of this same alloy steel used for heat-chemical treatment, which was carried out in different conditions for those plates. The plate which contained a phase with chromium in its surface layer was characterized by increased micro-hardness resulting in higher resistance to wear.

Piotr Tarasiuk, Krzysztof Molski, Tomasz Koziolkiewicz, Adam Adamowicz, Andrzej Szymaniak, Barbara Funkowska
Corrosive and thermal phenomena appearing in full scale testing of wheels of low speed vehicles

The present paper deals with the analysis of corrosive and thermal phenomena appearing in full scale testing of wheels of low speed vehicles. It has been shown that the presence of thermal cycles consisting in heating and cooling of the tested wheels increases corrosive processes due to the water condensation at the central part of the rim where the cooling conditions are the most favorable. This process can affect the durability of the wheel, especially in the cases when it additionally overlaps with the weakest point of the structure. In such cases the damage accumulation process significantly increases. Corrosion can be avoided or strongly limited by the use of nitrogen instead of air for inflating wheels or by carrying out the experimental tests in continuous manner, which would eliminate the cooling phase of the test. Intensive heating of the wheels during the tests increases the pressure in the tubeless tire and changes its rigidity. This phenomenon influences the stress distribution in metallic part of the wheel and introduces additional loading to the structure.

Karolina Walat, Tadeusz Łagoda

Application of the covariance extremum on the critical plane for fatigue life determination under random bending and torsion loading

The paper presents application of the covariance extremum between normal and shear stresses for determination of the critical plane position. The fatigue stress criterion was formulated as a linear combination of normal and shear stresses on the defined critical plane. The weight coefficients occurring in this criterion were determined from fatigue tests in the layer of pure bending and pure torsion. The proposed model was verified while fatigue tests under cyclic and random proportional and non-proportional bending with torsion (specimens made of aluminium alloy PA6-T4 were tested).

Ryszard Wójcicki, Edward Murdzia

Method of the determination of sleeve wear in radial journal bearing

The variations of the geometry of lubricating gap in the process of sleeve wear have vital effect on the static and dynamic properties of hydrodynamic journal bearings. In the process of the investigation of wear effect on the bearing properties, the value of wear in the geometric sense and the position of wear range are very important. The wear causes the changes of oil film geometry, hence the necessity of the determination of the depth and range of local wear of sleeve operating surface. In the current investigation the method of the wear determination that is based on the measurements of the roundness profile of operating surface of journal bearing was developed. This paper presents the experimental method and the analysis of the wear profile of sleeve sliding surface. The analysis was carried out for the sleeves made of bearing material PbSb15Sn10 and SnSb12Cu6Pb according to PN-ISO 4381:1997 (commercial name L16, L83) operating with the steel journal.

Jolanta Zimmerman, Lucjan Śnieżek

Numerical analysis of load-carrying capability of conical forced-in joints

The paper concerns the investigation of the conical interference fit joint load capacity subjected to torsion using FEM. The problem has been solved as a three dimensional, nonlinear with contact between joined elements. Using the calculated results, the dependence between the limiting twisting moment and axial interference force, which was used to carry out the connection, was established.