MANUFACTURING TECHNOLOGY
November 2015, Vol. 15, No. 5

Content

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Tel.: +420 475 285 534
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Print
PrintPoint Ltd, Prague

Publisher
J. E. Purkyne University in Usti n. Labem
Pasteurova 1, 400 96 Usti n. Labem
Czech Republic
VAT: CZ44555601

Published 6 p. a., 300 pcs.
published in November 2015,
210 pages

Permission: MK CR E 20470

ISSN 1213–2489

indexed on: http://www.scopus.com

MANUFACTURING TECHNOLOGY
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Construction Product Quality Improvement with Applying Production Problems Analysis

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The study and analysis of the production process of the aluminum joinery allow identyfing factors significantly affecting the product quality. The main factor is undoubtedly the experience of employees, skills and the knowledge acquired during training and the aluminium ironworks. To improve construction aluminium product quality, production areas with identified nonconformities are the object of the analysis. Detection of nonconformities is an important element in this type of post-operative control process. It is recommended mainly to control the cutting sections, folding and crimping. The reliability increase performed on these operation positions significantly affects the product quality. The modernity level of the machinery has also significant meaning mainly for the process productivity.

Keywords: Alluminium Joinery, Quality, Production Control, Value Engineering

Acknowledgement

This work is related to the scientific program of the "Improving quality of processes, products and services" BW 615/201/07 supported by Polish Ministry of Science and Higher Education.

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Paper number: M2015137

Material Analysis of Projectile Hard Core

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Ammunition projectiles disposal armored facilities used hard core as the main effect. The hard core has a smaller diameter than the calibre of gun. The core of the projectile is made of tungsten carbide, titanium, molybdenum or depleted uranium with a hardness of 80 to 120 measures by the Rockwell hardness test. The core must be not only hard but also tough and have a high bending strength. Knowledge of the hard core chemical composition, which the attacker uses, is important in relation to provide ballistic protection, minimization of radioactive risk and optimization of conditions for disposing of old ammunition. The basic tool for detection of the necessary data is material analysis. This analysis provides information about the weight, chemical composition and material microstructure of the hard core.

Keywords: Ammunition, Hard core, Material analysis, Chemical composition, Material microstructure

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Paper number: M2015138

Checks Crane Hooks

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Paper deals with comparasion of methods for resolving stress state on the example of forged crane hook of selected load. For suitability of the comparasion is necessary to achieve comparable stress values by different methods. Problem of solving of different assignments by different methods is very extensive, and because of it, there is not clear answer, which of methods is universal and so always optimal. Any factors, that enter to the calculation and influence it, is the best way to choose an optimal method for solving of strength problems in mechanics.

Keywords: Crane hook, FEM analysys, Analytical and graphical methods.

Acknowledgement

This paper was created during the processing of the project No. *APVV-0842-11:* ***"Equivalent railway operation load simulator on the roller rig". The work is also supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench.", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and No. 1/1098/11: "Stress Distribution in a Braked Railway Wheel".***

This paper was published with the financial support of the European Union.
„We support research activities in Slovakia / Project is co-financed from EU sources"

ITMS 26220220070

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Paper number: M2015139

Measurement of Temperature Fields in Methal Hydride Storage Container

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The article analyses the measurement with increased absorption kinetics of hydrogen into the $La_{0.85}Ce_{0.15}Ni_5$ alloy. Within a time interval of 180 s an amount of 0.142 kg (1.58 m^3) of hydrogen was absorbed into 56 kg of alloy. The process of absorption was accompanied by an increased temperature of the bed. Therefore it was simultaneously cooled by a cooler using Peltier elements. The numerical calculation of non-stationary heat transfer within the bed was performed with a known amount of heat generated in the bed, known temperatures and flow rates. Simulation results allow us to determine temperature time paths at key points of the bed and give insight on the transient phenomena which occurs in the extreme load of the metal hydride (MH) bed. The temperature field is analyzed for different values of thermal conductivity, view of its change during the lifetime of metal hydride. This allows establishing safe limits for the absorption of hydrogen into a particular alloy.

Keywords: Measurement, temperature field, numerical simulation, Ansys CFX, metalhydride, hydrogen.

Acknowledgments

This paper was written with the financial support of the granting agency KEGA of the Ministry of Education of the Slovak Republic within the project solution No. 041TUKE-4/2013, of the granting agency VEGA of the Ministry of Education of the Slovak Republic within the project solution No. 1/0686/13.

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Paper number: M2015140

Theoretical and Experimental Determination of a Velocity Profile under Turbulent Air Flow in Pipework

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The paper experimentally and theoretically analyses the velocity profile of air in laboratory stand pipework. Flow velocities measured using a hot-wire anemometer and a vane anemometer were compared with the results of numerical simulation. The k-ε turbulence model was used in the numerical solution of flow rates and for determining the velocity profile using the ANSYS_CFX program. Using power law, this profile was described via an analytical function. Velocities determined by measuring with both instruments in the investigated place in the pipework showed lower values in comparison with the numerical solution. The cause of the difference in velocities was probably inaccurate stating of the volume flow of air through the ultrasonic anemometer. Measurements and simulation showed slight asymmetry in velocity which is related to an insufficiently large volume of the equalisation chamber and the mutual position of the input and output openings.

Keywords: Velocity profile, Hot-wire anemometer, Vane anemometer, Numerical simulation

Acknowledgement

The paper was prepared with the support of the VEGA 1/0004/2014 ME SR and SP2015/86-FMMI VŠB TUO.

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Paper number: M2015141

Multibody System of a Rail Vehicle Bogie with a Flexible Body

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In the field of designing of new or renovating the existing rail vehicles the iussue of individual structural units lifetime is currently appears increasingly coming to the fore for the vehicles long-term operation. On one hand, modern tools of virtual reality allow performing stress analysis of structures, most frequently using FEM, on the other hand, there is software designed for multibody system assembly intended for the evaluation of rail vehicles dynamic properties. Flexible bodies' implementation into a rail vehicle multibody system considerably extends the possibilities of computer simulations of rail vehicles running. In this paper we present inclusion of a flexible body into a multibody system of a rail vehicle bogie. We chose a freight wagon bogie for the purposes of modelling and simulation. Parameters of the fright wagon correspond to a Y25 bogie. Simulation calculation of the bogie running on the track have been performed using a track model consisting of two reverse curves.

Keywords: multibody system, flexible body, rail vehicle, computer simulation

Acknowledgement

The work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and the project No. APVV-0842-11: "Equivalent railway operation load simulator on the roller rig".

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Paper number: M2015142

The Numerical Solution of the Aerodynamic Task Using by CFD Modelling

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The solution of the aerodynamic task is a very complex issue. An accurate description of the aerodynamic field is used for the specification and the solution of an aero-acoustic task. With the numerical modelling onset the possibilities of investigation of the flow around body are still expanding. The aim is to establish basic parameters by which the flow field around the body is described. This paper deals with the numerical modelling of the flow around a cylinder and a sphere and with the evaluation of the parameters (coefficients) for these bodies. The modelling is performed using the software tools Ansys Fluent and OpenFOAM. The basic setting of the numerical simulation is described and test of the calculation stability and mesh quality for a given task is done. The calculation setup is briefly shown for the computational tool OpenFOAM. At the same time, the experimental result is shown in this paper to verify the results of the numerical simulations. The experimental equipment – a wind tunnel is specified by its basic parameters and possibilities for the aerodynamic task measuring. Experimental data are obtained using by hot-wire anemometry – one-wire and two-wire probe.

Keywords: aerodynamic, numerical modeling, CFD code, simple body, hot-wire anemometer

Acknowledgement

This paper was funded by specific research on the Technical University of Ostrava named Zkoumání dynamiky tekutinových systému, code SP2015/95.

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Paper number: M2015143

Investigation of Cutting Temperature during AlCu3MgMnPb Aluminium Alloy Turning

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The main aim of this experimental paper is investigation, analyzing and realizing the experimental measurement of cutting temperature when external turning of rotational parts made from AlCu3MgMnPb aluminum alloy. In this experimental study a number of turning tests have been carried out by using a test lathe and a cutting temperature measuring device. This measurement have been successively investigated and experimentally verified with the special samples (in experimental measuring of the temperature during the turning process of samples and measured results designated with special thermal camcorder type FLIR used for special measurement of cutting temperature). The theoretical contribution of the realized experiment is the finding that the change of cutting speed, depth of cut, feed motion and cutting temperature increase with increasing of the chip emerging influence factors change over time. Practical benefit is recognition that the emerging shape of the chips in turning of aluminum alloy is a consequence of the deformation process, which depends on the measured sample from its crystal structure and the conditions under which the deformation process occurs mainly by the deformation, cutting speed and temperature.

Keywords: Aluminum Alloy, Camcorder FLIR, Cutting Temperature, Turning Technology

Acknowledgement

Authors would like to acknowledge the experimental facility provided by the Faculty of production technology and management (J. E. Purkyne University in Usti nad Labem), Faculty of special technology (A. D. University of Trencin) and Faculty of Education (University of Hradec Kralove) to carry out this experimental work and research.

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Paper number: M2015144

Proposal of Biomass Heat Source for Microcogeneration Unit

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The use of renewable energy sources in Slovakia is currently very debated issue. The main cause of this discussion is the increase of energy prices, which increasingly burden the population and companies. The use of renewable sources, including biomass, represents an important contribution to solve this problem. When new heat source is designed, several technical regulations and recommendations must be followed. The proposed device is intended to serve for combustion of biomass, in the form of wood, of pellets. The aim of this work is to describe the design process of the combustion device as the main source of thermal energy in our proposed micro-cogeneration unit.

Keywords: Biomass, combustion, microcogeneration unit

Acknowledgements

This work is supported by the European Regional Development Fund and the State budget with project "Research Center of University of Zilina" ITMS 26220220183.

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Paper number: M2015145

Model of Heat Load on the Atmosphere by Flue Fases

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This paper presents the analysis of heat load on the atmosphere by flue gases emitted from boilers combusting fuel wood with moisture content *W = 10 - 60 %.* From the analysis results, that the heat load on the atmosphere is affected by the moisture content of combusted wood, as well as the construction of the heat generator's boiler part – the extent of cooling of exhaust gases. The value of heat load factor on the atmosphere by flue gases from combustion of dry fuel wood with moisture content W = 10% at flue gases temperature t_s = 120 ^{0}C is F_Q = 96,22 MJ.GJ^{-1}. The factor's value at moisture content of the fuel wood W = 60% and flue gases temperature t_s = 200 ^{0}C equals F_Q = 340,67 MJ.GJ^{-1}.

Keywords: biofuel, wood, moisture content, flue gases, atmosphere.

Acknowledgments

The present contribution was developed under the research of a grant project: KEGA- SR Nr: 006TU Z-4/2014, as a result of the work of the authors and a significant assistance of the Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic (KEGA-SR)

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Paper number: M2015146

3D Printing as an Alternative to Casting, Forging and Machining Technologies?

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3D printing technology has recently extended to metallic materials and allows now to produce 3D models directly from metallic powders. There are several methods of 3D metal printing, such as *Selective Laser Sintering* (SLS), *Direct Metal Laser Sintering* (DMLS), *Electron beam melting* (EBM) or *Selective laser melting* (SLM). Compared to conventional technologies of casting, forging and machining, these methods offer many advantages. The most important is shape variety allowing preparation of very complicated shapes and designs, which would be impossible to reach by classical techniques. Moreover, there is practically no material loss, since the remaining powder can be recycled and reused in other manufacturing processes. That is one of important cost savings. However, for now, the metal 3D printing is unable to compete the price of large-lot production. In present paper, it is demonstrated that by the SLM technology it is possible to achieve comparable material properties of stainless steel AISI 316L as by conventional technologies and therefore, this method offers a suitable alternative.

Keywords: 3D printing, SLM, AISI 316L, mechanical properties

Acknowledgement

Authors wish to thank the Czech Science Foundation (project no. P108/12/G043) and specific university research (MSMT no. 20/2015) for the financial support of this research.

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Paper number: M2015147

Geometrical Optimization of the Induction Heating Process in Order to Achieve Uniform Gloss on Plastics Components

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The article deals with numerical simulation of induction heating process as a coupling of electromagnetism and heat transfer with the scope to surface temperature optimization. The article presents how the position of the inductors used in the induction heating process influence the resulting temperature of heated surface. The scope of the article is to show methodology to optimize surface temperature by numerical approach.

Keywords: Induction heating, Electromagnetic field analysis, Thermal analysis, Optimization

Acknowledgement

This work has been supported by grant project VEGA No. 1/0234/13.

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Paper number: M2015148

Analysis of Force Conditions of the Hot Forming Machine in Rolling-Out of Bearing Rings

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The main parameters of the hot forming machines are production capacity and the fatigue life of the used tools. The life of a tool depends on its shape and load. The load depends on the structural design and speed of forming. The goal of our paper is to present the structural optimization and technological parameters design with respect to tool life. This process is applied in the case of the hot forming machine analysis.

Keywords: Design, Optimizing Process, Hot Forming, Tool Life

Acknowledgements

This work has been supported by grant project VEGA No. 1/0234/13.

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Paper number: M2015149

Performance and Emission Parameters Change of Small Heat Source Depending on the Moisture

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It is relatively complicated to effectively burn biomass. Combustion of biomass fuel itself as a renewable energy source does not automatically ensure the best use of its energy content with low emission production. Biomass combustion with bad settings of combustion conditions can be ineffective and with a high production of emissions. The article discusses the impact of humidity on the thermal technical parameters of the heat source. The influence of the relative humidity of combustion air and the fuel moisture on thermal power and emission production in automatic boiler for combustion of wood pellets were specifically determined. The results show that these properties of combustion air and biofuel have an effect on the thermal and emission parameters of biomass heat source. Biofuel moisture had higher impact on thermal power and emissions production in comparison with relative humidity of combustion air impact.

Keywords: Dendromass, Emissions, Fuel moisture, Air humidity

Acknowledgement

This work was supported by the projects "Výskumné centrum Žilinskej univerzity v Žiline ITMS 26220220183" and "Moderné zdroje tepla pre vykurovanie KEGA 070ŽU-4/2013".

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Paper number: M2015150

Examination of the Machinability of Eutectic Aluminium Alloys

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The industrial use of aluminium alloys has significantly increased in the last decades. Most machined parts are produced by cutting. Therefore, research in this field is quite important nowadays. Surface roughness is an extremely important quality parameter of a product, such as geometrical sizes and their tolerance. The authors in this article analysed the machinability of die-cast aluminium alloys with silicon often used in the industry. The turning experiments were made with different diamond tools edge geometry. The surface roughness obtained during turning was analysed in detail. Phenomenological models were created with which the surface roughness producing ability of the examined tools can be estimated in technological design.

Keywords: aluminium fine turning, eutectic aluminium alloy, design of experiment, surface roughness, phenomenological model

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Paper number: M2015151

Degradation Processes in the Contact Layers of Forming Tools

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The article deals with cyclical abrasive wear of the surface of forming tools. At this stage the research focused on the genesis of stress in the contact between a deformed material and a tool in the cold bulk forming process. The experiments were conducted in the simple configuration of the upsetting test. The article presents the results of abrasive wear by a combination of materials of examined samples and upsetting plates. The abrasive wear in the used material specimens was analysed comparatively in the form of the wear factor by the finite element method. Two intersecting phenomenological fields represent the output for the examined material combinations. Firstly, it is a formulation of the dependencies of the maximum depth increase of the surface wear. The argument is the number of exposure cycles. At the same time, the topology of degradations and the resulting roughness in the space of the exposed surface were examined.

Keywords: Cyclical Abrasive Wear, Wear Factor, Roughness, Wear Depth

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Paper number: M2015152

Method of Vortex Structure Identification in Axisymmetric Flow Field

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The article deals with the analysis of axisymmetric flow field from the point of view of vortex identification. The vortex is identified by using residual vorticity defined in the work [1]. The identification is based on the so called triple decomposition of motion [1]. The idea of vortex identification based on the residual vorticity which is easily applicable in the case of two dimensional flow field is extended to the case of axisymmetric flow. The analyses is based on the decomposition of velocity gradient tensor and on the search of so called basic reference frame which allows to examine clearly the kinematics of the flow field.

Keywords: Vortex Identification, Residual Vorticity, Tripple Decomposition, Axisymmetric Flow

Acknowledgement

The support from the Czech Science Foundation under Grant No. 14-08888S is gratefully acknowledged.

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Paper number: M2015153

The Using of Vehicle Moving Simulation to Proposal of Construction Work

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The article describes main possible usage of results of dynamic loading simulation with using of computational simulating system MSC. ADAMS. AVT and simulating computational model of track vehicle undercarriage. Main contens of article is the descripton of using of results for design value make-up file of changes of vehicle chassis parts and its new operating settings. The second described possibility of results simulation calculations usage is making - up of aproximate relations for transaction of fast orientation calculations. The next possibility of usage of simulation results is the possibility to verificate of mathematic model. The optimalization of influence changes of several design value together is last mentioned possibility of usage of simulation calculations results in the contens of this article.

Keywords: computation modeling, simulation

Acknowledgment

The article arose under effective supports of Experimental intention of Faculty of Military Technology of University of defence ev.Nº FVT 000401.

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Paper number: M2015154

Pressure Analysis on the Surface Gearing Investigated by Numerical Simulation of Oil Flow in the Tooth Wheel Gap

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The key topic of this article is a study of the oil flow and pressure distribution on the surface gearing investigated using numerical simulations. Particularly, this paper is focused on a simulation of the single flow of oil, which is governed by the gearing motion. Results of the unsteady flow between two rotating gearing could help to identify reasons of damages of gearings. The destruction of surface is identified after several hours on the helical gearing which is used in a heavy industry. In the case of moving and rotating gearing, it was necessary to use dynamic mesh and procedure of remeshing based on the parameters of quality cells. The simulation provides the complete information of pressure distribution on the surface of gearings. By the analysis of numerical results the areas with the high frequencies of low pressure were identified.

Keywords: Computational fluid dynamic, dynamic mesh, oil flow, cavitations

Acknowledgement

This work has been financially supported by the research project TUL No. SGS 21000.

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Paper number: M2015155

Numerical Simulation of Inviscid Compressible Fluid Flow Around Moving Bodies

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The article presents numerical code which was developed for solution of inviscid compressible fluid flow in domains with deforming boundaries. This computational method for the numerical solution of the non-linear system of Euler equations in time-dependent domains was designed as the first step of solution of fluid-structure interaction problem. Arbitrary Lagrangian - Eulerian (ALE) description of continuum, combining Eulerian and Lagrangian approach, was used to describe the inviscid fluid flow in time-dependent domain. The spatial discretization was provided by finite volume method adapted for triangular computational grids. Inviscid fluxes were discretized by the Rusanov flux scheme and Van Leer flux splitting scheme. The computational code was validated using a case of inviscid fluid flow around vibrating airfoil NACA 0012 which was experimentally investigated by AGARD group in 1982. Boundary conditions and simulation parameters were set according to the conditions of experimental measurement and the rotation angle of the body was defined by a time-dependent function. The numerical results are compared with experimental data and results of other authors. The algorithm for the mesh deformation is presented.

Keywords: Inviscid fluid, ALE form of Euler equations, deforming mesh, NACA 0012

Acknowledgement

I would like to gratefully acknowledge the support of the research project TA ČR n. TE01020068 "Centre of research and experimental development of reliable energy production".

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Paper number: M2015156

Glass Furnace Controlling from Saving Energy Aspect

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The article is the possibility of energy saving of glass furnaces Bonacci when operating. A proposal to energy saving is aimed at changing of the control process of furnaces and installation of closing doors inlet and outlet ports of furnaces. By inlet and outlet ports of these continuous furnaces considerably leaks thermal energy when are not used (i.e. breaks at work). The doors are designed as a hollow panel, which is filled by isolation. This leads to a considerable saving of energy and to reduce of operating costs. The current control process of furnaces is now obsolete and can not flexibly changed it according a change of manufacturing products. The newly designed controlling systems is controls not only the kinematics, i.e. moving actuator of glass, but also temperatures in furnaces and newly inlet and outlet doors for closing of holes.

Keywords: Glass furnace, heat loss, construction of gates

Acknowledgement

The research work is supported by the SGS – UJEP, Czech Republic.

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Paper number: M2015157

Measurement of Flow Characteristics in a Model of Aneurysm by PIV and FLIF Method

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The paper describes the flow measurement in an aneurysm model by PIV (Particle Image Velocimetry) and PLIF (Planar Laser Induced Fluorescence) method. The velocity field and the concentration were determined for four steady and one unsteady flow regimes.
The area of the main flow and the area of liquid circulation in the region of the bulge were defined on the basis of velocity field measurement. Mean concentration of dye was evaluated in three areas: the entry to the model, the bulge of aneurysm and the outlet of the model. Concentration in course of time and residence time of dye are discussed on the dependance of unsteady flow.

Keywords: Aneurysm, PIV method. PLIF method, flow field, concentration measurement,

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Paper number: M2015158

CO_2 Dispersion after Combustion

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This study deals with a numerical simulation of CO_2 dispersion after combustion of Ethanol. Numerical simulations were carried out with Reynolds averaged Navier-Stokes (RANS) approach. The mixture fraction theory was used for modeling of combustion. There were tested k-ε and k-ω turbulent models. Results obtained from numerical simulations were compared with results from an experiment.

Keywords: CFD, indoor air quality, non-premix combustion, carbon dioxide, ethanol

Acknowledgement

This work was financially supported by European Project no. CZ.1.07/2.3.00/20.0139 "Building of an excellent scientific team necessary for experimental and numerical modelling of fluid mechanics and thermodynamics".

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Paper number: M2015159

Machinability of Lead Free Copper Alloys

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Lead is traditionally used for completing free-machining materials. This paper deals with newly developed lead free copper alloys. Unfortunately, lead affects the haematological and nervous system. Therefore, materials containing lead represent one of the greatest environmental problems in world production. Research Material Institute in Panenske Brezany (CZ) developed new environmentally friendly cooper alloys. Machinability of these materials was tested at the Department of Machining, Process Planning and Metrology CTU in Prague. Some of the research results related to the machinability from the viewpoint of chip forms, surface roughness, cutting temperature, cutting time in drilling with constant feed force, and forces in cutting are presented.

Keywords: Machining, Cooper alloys, Lead free, Machinability

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Paper number: M2015160

A 3D Laser Scanner Setup for a Measuring of Geometrical Product Specifications

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The laser line scanners are coming to be frequently used in a field of dimensional inspection process. There are several phenomena that make the data acquisition more difficult. Particularly secondary reflection, direct reflection, scan overlapping, outlying points. The effect of these phenomena can be minimised by optimal setting of scanning parameters stated in this paper. The parameters were determined from an experimental measurements of 50 various parts. Additionally a thermal stability effect was measured at two types of Nikon scanners. The stabilisation time and the systematic error were determined for the scanner LC15Dx: 45 min, 20µm and 30 min and 37 µm for the LC60Dx scanner. It should help to prevent the systematic errors during the measurement.

3D Scannig, Laser Line Scanner, Dimensional Inspection, Stabilisation interval.

Acknowledgement

This paper was created with the support of Topmes s.r.o. that provided the equipment necessarry to perform the tests.

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Paper number: M2015161

Induction Heating of Inner Rolling Bearing Ring in ANSYS

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Aim of this paper is to explain capability of ANSYS to model induction heating of inner rolling bearing ring. This physical problem requires simulation of the interaction of three physical fields. First field is harmonic low-frequency electromagnetic, second transient thermal and third static structural analysis. The skin effect requires the fine mesh in areas near boundary of modeled ring in the vicinity of inductor. MFS concept is used to couple these three physical fields. Main result of this analysis is the thermal field history in inner ring. This analysis is used to obtain sensitivity data for appropriate shape and size of inductor to austenitize required domains of inner ring.

Keywords: Induction heating of inner ring, ANSYS APDL, Thermal field

Acknowledgement

This research was supported by the Slovak Research and Development Agency under the contract No. APVV-0736-12 and VEGA V-13-010-00.

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Paper number: M2015162

The Effect of Plasma Nitriding Parameters on the Thickness of Nitrided Layers

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This paper is aimed at chemical-heat treatment of a selected material. The plasma nitriding layers were applied on the 41CrAlMo7-10 steel. The influence of plasma nitriding parameters on the thickness and microhardness of nitrided layers were investigated. Plasma nitriding was performed at 500°C with a mixture atmosphere of H_2 and N_2 in the plasma nitriding equipment. The pressure of plasma nitriding process was determined to be 280 Pa. The period of the plasma nitriding process was changeable from 5 to 30 hours. The microstructure and mechanical properties of the nitrided layers were studied by using GDOES spectrometry, optical microscopy, and hardness testing. The depths of the plasma nitriding layers were also estimated using cross-sectional microhardness profiles. Microhardness and surface hardness of mentioned samples were significantly increased. The measurements have shown that the period of plasma nitriding process has a significant influence on the depth of nitriding.

Keywords: Plasma Nitriding, Microhardnes, Nitriding Period, Nitrided Layer,

Acknowledgements

The paper was prepared with the support of the Project "Promoting Research, Science and Innovation in the Field of Engineering" of the Department of Mechanical Engineering, University of Defence.

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Paper number: M2015163

Influence of Initial Carbon Concentration on Nitride Layers

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The properties of plasma nitride layer are determined except technological parameters by chemical compositon and structure of steel. Experiments were carried out on ARMOX 500T steel. Firstly, the samples of steel were carburized and isothermal hardened. After quenching the course of microhardness was measured from surface to the core of material. Samples were cutted off on metallographic saw and subsequently grinded from the surface to the core of material. All depths of grinded surface from surface to the core were exactly defined. The chemical composition was verified in each prepared samples. Samples with changeable content of carbon were nitrided by plasma nitriding technology. All properties of plasma nitriding layers were evaluated.

Keywords: Diffusion, Plasma nitriding, Armor steel

Acknowledgement

The paper was prepared with the support of the Project for the Development of the Organization and by the Specific research project 2014 of the Department of Mechanical Engineering, UoD "Promoting Research, Science and Inovation in the Field of Engineering".

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Paper number: M2015164

Analysis of Selected Thermodynamic Derivative Properties of Natural Gas Pipeline Flow Model

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The thermodynamic derivatives based on fundamentals thermodynamic space and physical parameters of natural gas influences other variables of pipeline systems such as pressure, temperature, velocity, density, gas compressibility, etc. These variables are crucial for gas pipeline system knowledge and its accurate operation. Fundamental parameters are derived such as Joule-Thomson (J-T) coefficient, isothermal throttling coefficient and isentropic coefficient. They influence gas flow when during the expansion of natural gas in the pipeline, the gas cools down due to the J-T effect and due to the interaction between pipeline system and its surroundings to the conditions at which gas is saturated by water vapour (dew point), and gas is not able to keep excess humidity and its condensation and gas hydrate formation will occur. The article deals with analyses of selected thermodynamic derivatives in the range of chosen temperatures and pressures and also non-isothermal steady-state flow model for pipeline is presented.

Keywords: gas pipeline, natural gas, thermodynamic properties

Acknowledgement

We would like to thank to: (1) Non-investment fund EkoFond, n. f., partner for Slovak Gas Industry for the financial support of project 563/PG04/2011: Rajzinger, J., Ridzoň, F. et al., "Reduction of energy consumption at gas pipeline system by application of new hydrate models"; (2) Scientific Grant Agency of the Ministry of Education of Slovak Republic for the financial support of project VEGA 1/0718/15: Malcho, M., Rajzinger, J., Jandačka, J. et al., "Accumulation of high potential energy through the generating process of natural gas and biogas hydrates".

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Paper number: M2015165

High-Speed Cutting of Bearing Rings from Material 100Cr6

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An article deals with a concept of increasing efficiency of a current production process of bearing ring machining. A goal is to substitute a generally expensive technology of cutting when at least the same integrity of a surface is kept. A theoretical part is focused on a characteristic and analysis of a given component including an applied material 100Cr6 from which bearing rings are made. A practical part analyses and suggests an innovation of increasing efficiency of the machining process. Series of samples would be tested experimentally at university conditions (Workroom C2 of Dept. of Machining Technology, Faculty of Mechanical Engineering, Brno University of Technology) using CNC Lathe Machine SP 280 SY.
The article describes individual production workplaces along with used tool equipment that includes for the process of increasing efficiency the innovation in the form of the change of the production process, changes of most cutting tools and cutting conditions needed for the turning of heat-treated bearing rings. The article also deals with a surface integrity after turning of bearing rings. The integrity is analysed using a touch measuring tools (a manual roughness tester TS100, a tool with an inductive sensor Form Talysurf Intra) and using a touchless measuring tool Alicona Infinite Forces G4, including the measurement of a residual tension in a surface layer (Barkhausen noise) by the tool Rollscan 300.
The article finishes with a wear test of replaceable cutting blades at applied cutting conditions with a follow-up discussion, which describes problematic steps that were done in particular phases of experimental testing, and with necessary concept of further testing of bearing rings.

Keywords: High-Speed Cutting, Hard Materials, 100Cr6, Bearing Rings, Turning, Surface Integrity

Acknowledgement

The research was supported and co-financed from a project of Ministry of Industry and Trade of the Czech Republic from a grant FR-TI4/247 Research and Development of Construction and Technology of Energetically Efficient Rolled Bearings with Brass Cage.

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Paper number: M2015166

Solidification of the Aluminium Alloy in the Mold

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The process of the aluminum alloy casting was investigated. Two materials of the mold were used to observe the effect of thermal conductivity on the time of the solidification. The simulation of the process was conducted in the CFD software respecting the radiation. The results of the designed model of the casting process were compared with the analytical solution obtained from literature.

Keywords: aluminum alloy, simulation, solidification, mold

Acknowledgements

This work was supported by SGA (Students Grant Agency) Jan Evangelista Purkyně University in Ústí nad Labem.

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Paper number: M2015167

Homogenization of Fibers Reinforced Composite Materials for Simulation Analysis

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The article is aimed to the development of homogenization procedures for fibers reinforced composite materials. The development of these procedures during the homogenization was performed by using a representative volume element (RVE). Two RVE versions were developed, hexagonal and square fiber arrangement. Both modules are automated and have been developed in the Python programming language with connection to FEM software Abaqus, which serves as a solver, and post processor. Afterwards the assembled modules follow homogenization of particular composite structures, which results are in a comparison with result gained from other homogenization methods (analytical methods for homogenization of composite materials) are processed into tables.

Keywords: homogenization, representative volume element (RVE), composite materials, finite element method

Acknowledgement

The work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and the project No. APVV-0842-11: "Equivalent railway operation load simulator on the roller rig".

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Paper number: M2015168

Arctic Air Cooler

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The article deals with the design of a process recirculation air cooler for cooling natural gas when the latter is processed. The cooler is intended for extreme climatic conditions, and due to this reason, it is necessary when designing and fabricating the cooler to comply with the specific requirements for both the calculation and materials to be used on constructing it. In the winter period when the ambient temperature drops even below the solidification point of the medium the cooler works with reduced rpm of the fan, and when necessary, even in the recirculation mode, partial or full (depending on the ambient temperature). In this case, the inlet and outlet louvers are closed, and the recirculation louvers are opened. This system allows, using the control of the temperature of the inlet cooling air, to maintain the temperature of the cooled medium at the desired level.

Keywords: air cooler, recirculation, tube bundle, thermal design quation

Acknowledgement

The article originated under the support of the grant SGS UJEP and the company Bronswerk Heat Transfer spol. s r. o., Benešov nad Ploučnicí.

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[11] GOST R (certification system of products for the Russian Federation)

[12] API STANDARD 661 (Standard for designing air cooler)

[13] ČSN EN 14986 (design of fans for work in explosion risk environment)

[14] http://www.bronswerk.cz

Paper number: M2015169

Numerical Simulation of Thermoelastic Stress Analysis

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This paper focuses on verification of experiment of thermoelastic stress analysis by using numerical solution. Thermoelastic stress analysis is noncontact technique to obtain thermograms, thermographic images of the stress fields, by using an infrared camera. In the elastic part experimental results can be used to determine the value of the first stress invariant under adiabatic conditions. The experimental part is dedicated to the postprocessing of the measured data. Numerical solution was performed by finite element method in two softwares: ANSYS and ABAQUS.

Keywords: numerical simulation, thermal stress analysis, stress filed, infrared camera

Acknowledgement

This work was supported by the Slovak Research and Development Agency under the contract No. APVV-0736-12.

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Paper number: M2015170

Freight Long Wagon Dynamic Analysis in S-Curve by Means of Computer Simulation

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The article deals with the dynamic analysis of long freight wagon with a low and multifunctional loading plane for intermodal transport. The main task of simulation was to verify enough overlap of buffers, when the vehicle rides through S-curve, because the wagon is equipped with non-standard construction of the front part of undercarriage. Simulation was performed in program Adams, module VI-Rail. These and similar analyzes are nowadays an integral part of the development process of rolling stock and greatly reduce the time necessary for design, tests and certification of new vehicles. In the future, it will be possible in the case of verification results replace some real tests by simulation analysis on certain conditions.

Keywords: S-curve, Long wagon, Buffers overlap, Dynamic analysis.

Acknowledgement

The work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and the project No. APVV-0842-11: "Equivalent railway operation load simulator on the roller rig".

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Paper number: M2015171

Wagon Chassis Frame Design with Adaptable Loading Platform

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The paper present the structural design of freight wagon chassis frame with adaptable loading platform with regard to the safe operation and assessment of the properties by the calculation methods of simulation analysis. 3D model of wagon was created in a computer program PTC/Creo. Wagon chassis frame was subjected to the static and dynamic analysis in programs ANSYS and ADAMS/Rail. On the basis of computer aided simulation analysis was optimized the frame of the wagon. This wagon chassis frame will be able to offer even more capacity and utilize less resources and energy than current wagons for intermodal transport.

Keywords: Freight Wagon, Adaptable Platform, Simulation Analysis.

Acknowledgement

The work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and the project No. APVV-0842-11: "Equivalent railway operation load simulator on the roller rig".

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Paper number: M2015172

Automation of Filling Cryogenic Vessels with Perlite

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Liquefied technical gases are used in almost all sectors, regardless of whether this is industrial application (engineering, food processing, electronics), as well as in health and other sectors. These gases are kept in cryogenic vessels. A cryogenic vessel is a two-walled vessel where the inner vessel is used to keep the gas, the outer vessel is used as packaging, and the space between the inner and outer vessels is thermally insulated. The insulation must have such parameters to ensure that the stored cryogenic gases remain in the liquefied state for the longest possible time. Various materials and methods are used to insulate the vessels, but the most common insulation for cryogenic vessels is perlite insulation in combination with vacuum. The problems of isolation of cryogenic vessels using perlite are dealt with by only a few specialized companies that produce vessels for liquefied technical (cryogenic) gases.

Keywords: cryogenic vessels, perlite, vacuum, cryogenic technical gases

Acknowledgements

The article originated under the support of the grant SGS UJEP.

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Paper number: M2015173

The Downhill Braked Railway Wheel Structural Analysis by Means of the ANSYS Multiphysics Program System Package

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Abstract: Article deals with the detection of reduced stress in a braked railway wheel based on thermal transient analysis on virtual models, because they influence the characteristics of the railway wheels. Structural analysis was performed by means of the ANSYS Multiphysics program system package. Thermal transient analysis deals with the detection of temperature fields which are result of braking by brake block. The applied heat flux represents the heat generated by friction of brake block. It is applied to the quarter model because of the acceleration calculation. This analysis simulates two braking with subsequent by cooling. Distribution of the equivalent stress was detected in the cross section railway wheel, at selected points. The input parameters were used from the thermal transient analysis. These equivalent stresses result due to thermal load.

Keywords: railway wheel, brake block, residual stress, transient thermal analysis

Acknowledgement

The work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences in project No. 1/0347/12: "Railway wheel tread profile wear research under the rail vehicle in operation conditions simulation on the test bench", project No. 1/0383/12: "The rail vehicle running properties research with the help of a computer simulation." and the project No. APVV-0842-11: "Equivalent railway operation load simulator on the roller rig".

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Paper number: M2015174

Machining with Plastic Cutting Wedge

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The paper analyses the possibilities of modification of cutting tool geometry in order to preserve a protective plastic zone of material at a cutting tool. Based on the results of model experiment as well as practical verification, a rapid increase in tool life has been achieved. The tool life is dependent on the size of the shortened rake face. Optimization of the tool face size enables to achieve multiplied tool life when comparing with a classical cutting tool. A uniqueness of this processes is the formation of the two chips, one of which is a created plastic layer along the edge of the cutting tool. The application of the tool is possible only with the plastic material cutting. Experimental tests were realized with usually used steels.

Keywords: machining, cutting tool, plastic deformation, tool wear

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Paper number: M2015175

Steady Flow in Various Geometries of the Carotid Artery Bifurcation

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The paper presents results of experimental investigation of steady flow in the region of common carotid artery (CCA). The CCA bifurcates into two branches: into internal carotid artery (ICA) and external carotid artery (ECA). ICA, that supplies blood to the brain is enlarged. This region is referred as the carotid sinus. In the present study, three models of the carotid artery bifurcation have been manufactured. The models vary in geometry of the carotid sinus. Their effect on fluid flow has been investigated under steady flow condition, utilizing Particle Image Velocimetry (PIV) and flow visualization. The flow conditions approximate physiological flow. The measuring range of Reynolds number was from 400 to 1300. Experimental results indicated the effect of carotid sinus geometry on the main flow in common carotid artery.

Keywords: Carotid Artery Bifurcation, PIV, Visualization

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Paper number: M2015176