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Content

479 – 484
The Analysis of the Model of Damping Mechanism for Shipborne Labyrinth Compressor Piston Components
Peng Ba, Yuwei Zhang, Shi Jia
485 – 489
Design of a Three-Finger Robot Manipulator
Miroslav Blatnický, Ján Dižo, Michal Timoščuk
489 – 496
Parametric CAD model of a double-lay six strand wire rope
Michal Fabian, Eva Stanová, Gabriel Fedorko, Stanislav Kmeť, Jana Fabianová, Jozef Krajňák
497 – 502
The Design of New Cycloid Gear with Variable Cross Section and the Research of End Milling in Five-Axis Machine Tool
Lizhi Gu, Jianmin Xu, Shanming Luo
502 – 506
Application of Lubrication into the Hip Joint Replacement
Andrea Haringová, Karol Stračár, Karol Prikkel
506 – 512
Investigation of the Influence of PVD Coatings Deposited on HSS Milling Cutter
Ales Jaros, Zdenek Fiala
512 – 518
Methodology of Experimental Analysis of Long-term Monitoring of Sandwich Composite Structure by Fibre-optic Strain Gauges
Dita Jiroutova
519 – 524
Industrial Robot Accuracy Testing with QC20-W Ballbar Diagnostic System
Jerzy Józwik, Ivan Kuric, Dawid Ostrowski, Krzysztof Dziedzic
524 – 531
Cutting Force Modelling with a Combined Influence of Tool Wear and Tool Geometry
Petr Kolar, Matej Sulitka, Petr Fojtů, Jiří Falta, Jaroslav Šindler
532 – 538
3D Roughness Parameters of Surfaces Face Milled by Special Tools
Janos Kundrak, Csaba Felho
538 – 543
Computer Visual Measurement Technology and Algorithm Simulation for the Assembly of Large Aircraft Parts
Qiong Liu, YouRong Yan, LeiLei Cao
543 – 551
The Parametric Design of the Frame of Agricultural Machinery Cab based on Analysis of Ergonomics Data
Sha Liu, Xue Yang
551 – 557
Extrusion Process Parameters Optimization for the Aluminum Profile Extrusion of an Upper Beam on the Train Based on Response Surface Methodology
Shumei Lou, Yongxiao Wang, Shuai Lu, Chunjian Su
558 – 561
Possibilities of Replacement of Two Side Metal Molds for the Production of Two Facing Side Composite by One Side Mold
Lukas Manas, Sona Rusnakova, Milan Zaludek, Ladislav Fojtl, Vladimir Rusnak
561 – 569
Simulation Tools Used at the Injection Mould Design
Peter Monka, Sergej Hloch, Andrej Andrej, Matej Somsak, Filip Murgas
569 – 574
Comparison of Linear and Nonlinear Optimization Methods of Heating Plant Operation
Peter Muškát, František Urban, Jozef Bereznai, Zdenko Závodný
574 – 578
Development of Integrated Technology of FRP Gear Manufacturing
Ihor Osadchiy, Dmytro Kryvoruchko, Vitalii Kolesnyk, Michal Hatala, Jan Duplak, Dusan Mital
579 – 585
The Impact of Vibration on the Technological Head
Anton Panda, Marek Prislupčák, Jozef Jurko, Iveta Pandová, Ivan Mrkvica, Slawomir Luscinski
585 – 590
Abrasive Water Jet Cutting Depth Optimization by Taguchi Approach
Andrzej Perec, Miroslava Ťavodová
590 – 595
Importance and Methods of Residual Stress Profile Measurement
Zdeněk Pitrmuc, Vítězslav Rázek, Libor Beránek, Marin Vrabec, Jan Šimota
595 – 600
Form and Dimensional Accuracy of Surfaces Generated by Longitudinal Turning
Umberto Prisco, Antonino Squillace, Fabio Scherillo, Fabrizio Coticelli, Antonello Astarita

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June 2016, Vol. 16, No. 3

Content

600 – 607
Comparison of ABI Technique and Standard Methods in Measuring Mechanical Properties of Aluminium Al-aloys
Maxim Puchnin, Oleksandr Trudonoshyn, Olena Prach, Františka Pešlová
607 – 612
A Power Monitoring System of Machine Tool
Ma Qinyi, Lu Mingyue, Shi Junli, Jin Haihua, Wang Yajun, Zhou Maojun
612 – 622
Analysis of Selected Aspects of Turned Bearing Rings Regarding Required Workpiece Quality
Josef Sedlak, Pavel Tropp, Josef Chladil, Karel Kouril, Ales Polzer, Karel Osicka
622 – 626
Effect of Technological Parameters on the Heat Transfer Coefficient in Alloy AlCu4Ti using Squeeze Casting Technology
Ján Ščury, Richard Pastirčák
627 – 633
The Mechanics of Machining Ultrafine-Grained Grade 2 Ti Processed Severe Plastic Deformation
Anastasiya Symonova, Francois Ducobu, Viktorie Weiss
633 – 637
Internal Damping Depending on the Deformation Amplitude Measured on Magnesium Alloys
Milan Uhríčik, Zuzana Dresslerová, Peter Palček, Monika Oravcová, Zuzanka Trojanová
637 – 641
Short Sisal Fibers Reinforced Epoxy Resins: Tensile Strength
Petr Valášek
641 – 647
The Application of Ultrasonic Levitation in the Rotor Support
Wang Hong-chen, Yang Zhi-gang, Liu Lei
648 – 653
Contact Analysis of Silicone Rubber Rectangular Ring in the Automatic Tighten Assembly
You JiaChuan, Lin JingDong, Xu DaFa, Hao WenYuan

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The Analysis of the Model of Damping Mechanism for Shipborne Labyrinth Compressor Piston Components

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Piston parts of a shipborne labyrinth compressor are mainly composed of a piston and a coated piston rod. In recent years, many studies have shown that the vibration response of coating structure is significantly reduced. Because of the non-contact of the piston, the cylinder case and guide support entirely depends on the piston rod. The lateral jitter can be regarded as the vibration of cantilever beam. However there is no effective method to separate the contribution of hard-coating damping from the damping of composite system. In this paper, based on separating the damping contribution of hard coating, the method of creating the damping mechanism model of piston rod is studied. Firstly, the piston rod before and after coating are tested and the characteristic parameters of vibration, such as natural frequency, damping ratio, vibration response are acquired. Moreover, according to the analysis of the storage and dissipation energy in the uncoated and coated rod, the damping contribution of hard coating has been confirmed. Finally, the Oberst beam theory is adopted to create the damping mechanism model of piston rod which includes both material damping and viscous damping. The correctness of analytical model is also verified by the experiment results.

Keywords: Hard Coating, Piston Rod, Damping Mechanism, Analysis Model, Basement Exciting

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Design of a Three-Finger Robot Manipulator

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The paper deals with a construction design of a versatile adaptive gripper for a robot manipulator. More specifically, it presents construction design of motional kinematics of fingers, which are controlled by a working screw, and also computation of forces and a selection of drive actuating units. Calculation of forces is needed for further correct selection of an engine transmission, considered gearing, belt gear and transmission.
Automation is a process of replacing man's control function by operation of various machines and devices. Automation is a highly complex process including very simple control operations, which are performed automatically by relatively simple devices, as well as very complex control of large production units. Control is a purposeful action of evaluation and processing of information about the controlled object or process, actions in the process (these may include measurement device data, signalling equipment states), and according to them, related machines are controlled so that the prescribed objective can be met – handling piece loads of maximal weight *m = 25 kg* in this instance.

Keywords: Manipulator, three-finger gripper, handling machinery

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Parametric CAD Model of a Double-Lay Six Strand Wire Rope

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Parametric modelling based on mathematical relationships allows creation of different variants of proposed solutions in real time. In particular, parametric modelling enables rapid design of 3D virtual models intended for further analysis and simulations. This paper presents an approach to design of a six strand wire rope model in a CAD environment. The presented model is characterized by double helical winding wires. Wires axes curves are mathematically expressed in the form of parametric equations. The parametric equations used in model generation are presented and the whole methodology of rope model creation in CATIA V5 software is briefly described.

Keywords: Parametric modelling, wire rope, CAD

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The Design of New Cycloid Gear with Variable Cross Section and the Research of End Milling in Five-Axis Machine Tool

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In order to improve the transmission efficiency and the service life of ordinary cycloid gear, 5 kinds of new cycloid gears with variable cross section are devoleped based on the principles of traditional cycloid drive. These new cycloid gears include concave cycloid gear, drum cycloid gear, spherical cycloid gear, oblique cycloid gear and cone cycloid gear. The general mathematical equations of these new cycloid gears are obtained and the characteristics of these new cycloid gears in transmission applications are analyzed in detail. A new method on the end milling tooth profile surfaces of cycloid gear using ball end mill is proposed. 5 axis numerical control simulations of these cycloid gears are conducted and the tool paths of machining cycloid gear are obtained. 5 kinds of cycloid gear with variable section are machined on five-axis CNC machining center, which verifies the correctness of the NC program. The study will provide a new way of designing and machining cycloid gear.

Keywords: The new cycloidal gear with variable section, End milling, Numerical control simulation.

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Application of Lubrication into the Hip Joint Replacement

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The article deals with application of knowledge from lubrication of healthy spherical joints into hip joint endoprosthesis. As the observed most important physical parameter it was selected the coefficient of friction responsible directly for lifetime of the endoprosthesis. The article describes as well as experimentally verifies the idea of additional lubrication of hip joint endoprosthesis.

Keywords: lubrication, coefficient of friction, endoprosthesis.

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Investigation of the Influence of PVD Coatings Deposited on HSS Milling Cutter

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This article deals with the benefits of PVD coatings ((Al,Ti)N; (Al,Ti,Cr)N and nanocomposite coating nACo®) applied to HSS three edges end milling cutters (producer ZPS – Frezovaci nastroje, Zlin, CZ). The coatings were synthesized by a cathodic-arc deposition process (producer Liss, Roznov pod Radhostem, CZ). Machining was carried out on the vertical milling machine FB 32V with using process liquid. Set up cutting conditions were constant throughout the machining. The aim of this experiment was to compare coated and uncoated HSS end milling cutters and find out the benefits of three kinds of PVD coatings. The monitored parameters were force loading and flank wear. Piezoeletrical dynamometer Kistler 9257B was used for measuring force loading and workshop optical microscope was used for measuring flank wear (criterion VB). The construction steel C45E (1.1191; CSN 41 2050) was used as workpiece material. Best results were achieved by tool with PVD coating (Al,TiCr)N.

Keywords: PVD coating, High-speed steel, milling, force loading, flank wear

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Methodology of Experimental Analysis of Long-term Monitoring of Sandwich Composite Structure by Fibre-optic Strain Gauges

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The aim of this article is proposition of new methodology of experimental analysis of long-term monitoring of sandwich composite structures. The sandwich composite structures are, due to its properties like stiffness, high impact strength, corrosion resistance, low thermal conductivity and low acoustic conductivity and, commonly used in civil engineering in recent years. This type of structure is composed of two main parts (face sheet and core) having different material and mechanical properties. Sudden change of these properties causes interlaminar stress in structure. A good knowledge about behaviour of sandwich composite structure is important for efficient manufacture techniques, long-term prediction of structure behaviour and for economics. The experimental part has been focused on obtaining the experimental results of deformation between layers of sandwich composite structure during long-term monitoring. The long-gauge optical fibres SOFO® SMARTape Compact have been used for long-term monitoring of sandwich composite structures. Long-gauge optical fibres were placed between the foam core and an outer layer of the composite structure during manufacturing. Test specimens were loaded in three-point bending test.

Keywords: Deformation, Sandwich composite structure, Long-term monitoring, Fibre-optic strain gauge, Three-point bending test

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Industrial Robot Accuracy Testing with QC20-W Ballbar Diagnostic System

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An important characteristic of industrial robots is their accuracy. It is of particularly importance in high-precision tasks, e.g. mounting or machining of elements. In order to meet the requested quality demands for products, as well as appropriate working conditions, it is absolutely essential to regularly inspect the technical condition of robots, e.g. their accuracy.The following paper aims at identification of accuracy errors of an industrial robot MOTOMAN HP20. The selected measuring method was the roundness test with the use of the telescopic, kinematic QC20W – Ballbar. The paper presents the methodology of experimental tests. The influence of the radius of the interpolation circle, as well as the influence of the set motion speed on the value of chosen accuracy errors was determined. The results were presented graphically and analysed.

Keywords: diagnostic, accuracy, robots, ballbar system

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Cutting Force Modelling with a Combined Influence of Tool Wear and Tool Geometry

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Modelling of cutting forces is important for understanding and simulation of the machining processes. This paper presents cutting force modelling of data obtained from machining of C45 carbon steel with a coated carbide tool. The model is based on a rather extensive measurement of 270 combinations of cutting tool geometry parameters (rake angle, clearance angle and helix angle), tool wear (flank wear average value), chip thickness and cutting velocity. The model with the friction and cutting component of the cutting force is presented and discussed. We conducted an analysis of the identified model and found a relationship between the increase in tangential and radial cutting forces and tool wear. We concluded that flank wear influences the cutting force acting on the worn tool more significantly than cutting tool geometry. This is caused by changes in cutting edge geometry and the resultant significant increase in the friction component of the cutting force as is shown using the identified model.

Keywords: Cutting Forces, Cutting Force Modelling, Flank Wear, Milling

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3D Roughness Parameters of Surfaces Face Milled by Special Tools

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At design of cutting tools the positioning of cutting edges and geometry of cutting inserts are becoming increasingly diversified with the development of cutting procedures. As a result, the generated tool marks on cut surfaces also can take many forms. Roughness values in face milling can change both in planes parallel with the feed direction and in planes at angle to it, therefore it is particularly important to be able to plan the roughness characteristics of surfaces. A new method is introduced in the paper for planning the roughness characteristics of cut surfaces that can be used to determine theoretical values of roughness characteristics of surfaces generated by tools having defined edge geometry. It is based on CAD modelling of the theoretical cut surface; practically any complex tool geometry can be modelled and 3D roughness parameters determined. In application of rotating tools a variety of tool designs and setting accuracy were taken into consideration during the determination of theoretical values for the simultaneous cutting of more than one edge. An example is shown for two different insert geometries.

Keywords: Roughness, Milling, Tool geometry

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Computer Visual Measurement Technology and Algorithm Simulation for the Assembly of Large Aircraft Parts

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This research aims to solve the issues of limited measuring range and great accumulative error in the digital assembly of aircraft parts. In this paper, we propose the use of array visual measurement technology for the assembly of large aircraft parts. First, the visual measurement space for large aircraft parts assembly is determined. Second, the visual measurement model for large aircraft parts is constructed. Then, the differences that occur in real-time to the global coordinates can be calculated by using the pre-assembly feature points of large parts and the measurement tools of an array visual system. Finally, the real-time simulation of the aircraft assembly process is conducted in ADAMS by the secondary development of the software. In addition, errors between the real-time assembly and the design model are solved, and then transmitted to the mechanical actuators, which in turn adjust their attitude to complete the assembly of the large aircraft parts. The results show that array visual measurement technology for the assembly of large aircraft parts is feasible and efficient.

Keywords: Aircraft Digital Assembly, Vision Measuring, Spatial Transformation, ADAMS, Motion Simulation

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The Parametric Design of the Frame of Agricultural Machinery Cab based on Analysis of Ergonomics Data

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The cab of the big-scale and medium-sized agricultural machinery is not only the main environment of the drivers operate the machine, but also by which the driver interact with the machine. Currently most China's agricultural machinery manufacturers will order the whole cabs for production, but not make them by themselves. Therefore to design the cab models by parametric customization would be better adapt to business needs and reduce the repetitive and mindless calculation and design. The design of cab mainly includes two types of parameters: the driver's ergonomics data and the constraint parameters provided by agricultural machine such as space area, etc.. In addition its shape should match the the whole style of the machine. The paper provides a parametric design procedure of cab's frame based on RhinoScript. Firstly the characteristics of a variety of cabs are analyzed and classified into several typical sorts; then the main ergonomics parameters and constraints of these cabs are extracted; finally the basic framework of the cab can be automatically completed on these data and constraints and a digital model can be generated by the chosen style of the agricultural machine.

Keywords: Agricultural machine, Cab, Parametric design, RhinoScript, CAD

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Extrusion Process Parameters Optimization for the Aluminum Profile Extrusion of an Upper Beam on the Train Based on Response Surface Methodology

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Extrusion process parameters play key roles in aluminum profile extrusion processes. In this literature, by using Box-Behnken experimental design to arrange the simulations using the ALE software HypereXtrude, Response Surface Methodology (RSM) were applied to study the simulation results and discuss the effects of five process parameters, namely billet diameter, billet preheat temperature, die temperature, container temperature, and ram speed, on the outlet velocity distribution uniformity of the profile named an Upper beam on the Train. The interactions between the five parameters also were investigated. Additionally, a second order response surface model between the extrusion process parameters and the evaluation criterion of outlet velocity uniformity was established. An optimization of the process parameters with the purpose to find the most uniform outlet velocity distribution was carried out based on the response surface model. The results show that the three parameters, namely billet diameter, ram speed and die temperature, have significant impact on the outlet velocity uniformity. And there are obvious interactions between these three parameters. After the subsequent optimizations, a more uniform outlet velocity distribution was obtained, and the final acceptable profiles were produced.

Keywords: Aluminum profile extrusion; Optimization; Process parameters; Response Surface Methodology (RSM)

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Possibilities of Replacement of Two Side Metal Molds for the Production of Two Facing Side Composite by One Side Mold

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Presented research paper deals with possibilities of replacement of conventional mold materials by new, unconventional. Traditionally, laminate, wood or gypsum molds (in the case of small production series) are used for the production of composite parts. Furthermore, milled aluminum molds are conventionally used only for mass production. Due to this, thin metal sheet was prepared as an unconventional production mold for manufacturing of motorbike facing part. Vacuum bagging using prepared one side mold was chosen as the most appropriate technology. Normally, two facing sides are not commonly manufactured using this technology. Because of this, possibilities to create two facing sides at areas that are not in contact with mold itself were investigated. Presented results can help manufacturing companies with their production and considerably decrease manufacturing costs due to not necessity to use two side molds.

Keywords: Carbon fibers, Prepreg material, Metal sheet mold, Facing part, Vacuum bagging, Vacuum technology

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Simulation Tools Used at the Injection Mould Design

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The article deals with the basic steps of injection mould design. The goal of the research was the proposition of the mould form so to be achieved the minimum waste and the shortest time of both mould filling and product cooling. Studied mould component is intended to serve as a stopper in the automotive spotlight. The simulations were realized for three designed types of running system and for four versions of cooling system. Due to the design optimization, the pressures, originated inside the cooling system and inside the mould cavity during the injection moulding process, were also investigated. 3D model of the mould was created in Autodesk Inventor Professional software and then solidification of material was simulated in Autodesk Moldflow. On the basis of the best solution, real form was manufactured and placed into injection moulding machine Arburg Allrounder 320 C.

Keywords: design, simulation, injection moulding, running and cooling system, pressure, waste

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Comparison of Linear and Nonlinear Optimization Methods of Heating Plant Operation

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The article presents comparison of optimization methods applied to operation of the heating plant. Optimizing problems are possible to solve with using of methods of the linear programming (LP) or nonlinear programming (NLP). In the paper method of differential addition (LP, NLP), method of characteristics (LP), simplex method (LP), method of Lagrange multipliers (LP, NLP) and method of hyperplane in n – dimensional space (LP, NLP) are presented from point of view of requirements for designing and modifications of the program, requirements on system memory and computation time, comparison of the optimizing methods for loading of the thermal power machines and devices.

Keywords: heat source, optimizing criterion, optimizing methods, heat source operation, fuel costs

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Development of Integrated Technology of FRP Gear Manufacturing

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Gears are integral part of mechanisms and machines. The development of new composite materials impulse to increase of specific weight and load-carrying ability of gears. Current trend can be supplied with fiber reinforced materials (FRP) whose specific weight strength could by five times higher than of hardened steel. Those the mechanical properties of FRP wheel can substantially be influenced by technological heredity than metallic one. That is why the influence of technological steps should be taken into account during FRP wheels manufacture. The purpose of current research is to develop integrated technique of FRP wheels manufacture. Consequently in current experimental research the cooperation of load-carrying ability of non metallic and metallic wheels was provided. Different techniques were used for optimization of reinforcement fiber geometry when FRP wheels manufacture. Operating procedure of wheel manufacture contents computer simulation of forming, and properties programming helped to provide quality and load-carrying ability of the wheels.

Keywords: Machining; Polymer gear; Fiber orientation; CFRP; Gear metrology

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The Impact of Vibration on the Technological Head

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The aim of the measurement was the observation (examination) and evaluation of the vibration impact on the technological head in the technology of abrasive water jet when changing the selected technological parameters, namely the feed rate of the technological head. The experiments were carried out on one kind of material - steel HARDOX 500 with a thickness of 10 mm. The impact of the change of the technological head's feed rate (400, 200,100, 50, 40 mm/min) on the size of the vibration acceleration amplitude and its frequency were examined. A database was created from the measured vibration values on the technological head and from that database the data was evaluated in selected softwares (LabVIEW, SignalExpress a Microsoft Excel). Graphical dependencies, frequency spectra covers and covers comparison graph were created from which new findings and conclusions were formulated.

Keywords: Hydroabrasive water flow, technological head, vibration, vibration acceleration amplitude, frequency.

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Abrasive Water Jet Cutting Depth Optimization by Taguchi Approach

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Existing models of predict the abrasive water jet cutting effects, does not give satisfactory results in a wide area of parameter changes, in particular for different, exotic materials. This implies the need to carry out extensive research in order to expand the empirical database. To optimize the process can be used modern methods referred to as Design of Experiment. One of the methods to determine the effect of parameters on the controlled different technological processes is the Taguchi approach. This method allows to limit the amount of research needed to achieve the desired test results, reducing the time required course for their performance and at the same time their costs. Characterized by Taguchi ratio signal / noise (S / N) enables the assessment of the significance of the impact of various parameters on the process, which is still not well enough understood. The article discusses one method for optimization of cutting tool steel, by high pressure abrasive water jet.

Keywords: abrasive water jet, cutting depth, Taguchi method, optimization, prediction

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Importance and Methods of Residual Stress Profile Measurement

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The contribution is dedicated to surface integrity assessment of components from the point of view of residual stress profile after machining and finishing technologies. Residual stresses play the key role for dynamic life and service reliability of the part, especially rotating aircraft airfoils made of titanium and nickel base alloys. Except a brief summary of measurement methods practical experience with application of Beam deflection method combined with electrolytic etching is published. Specific measurement results for real aircraft Ti6Al4V airfoils and Ti6Al4V plates following its manufacturing technology are the subject of experimental part.

Keywords: measurement of residual stress profile; beam deflection method; electrolytic etching; titanium airfoils, thumbling; laserpeening

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Form and Dimensional Accuracy of Surfaces Generated by Longitudinal Turning

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The influence of the dynamic behaviour of the machine tool/workpiece system on the surface accuracy plays an important role in finish machining. In particular, the machine tool/workpiece dynamics determines the topography of the machined surface, which is crucial in determining the quality and performance of a mechanical part. A model to predict the dynamic effects of the cutting process in turning, as part of a machining simulation framework, is presented in this paper. Thermally, kinematically and dynamically induced errors can be easily implemented into the proposed model. Finally, several examples of the use of this model under different turning conditions are presented and compared to typical machined surfaces. The proposed model can effectively compute the roughness, form and dimensional accuracy of a turned surface.

Keywords: turning, accuracy of machine tool, tool vibrations, surface topography

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Comparison of ABI Technique and Standard Methods in Measuring Mechanical Properties of Aluminium Al-aloys

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Mechanical properties and chemical composition of aluminium alloys were investigated by automated ball indentation tests, scanning electron microscopy and energy dispersive X-ray analysis.
In this work, Automated Ball Indentation (ABI) technique was compared with the standard mechanical tests. ABI method is based on the load controlled multiple indentations into a polished surface by a spherical indenter. The indentation depth is progressively increased to a maximum user specified limit with intermediate partial unloading. This technique allows to measure the yield strength, stress-strain curve, strength coefficient and strain hardening exponent.
For all these test materials and conditions, the ABI derived results were in very good agreement with those obtained from conventional standard test methods.

Keywords: Al-alloys, microstructure, mechanical properties, ABI tests

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A Power Monitoring System of Machine Tool

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This paper completes a design of power monitoring system of machine tool based on MSP430F149 microcontroller. This system is mainly divided into four modules: the electric energy information input and processing module, electric energy metering operation processing module, Single-Chip Microcomputer system internal data processing module, and PC memory module, respectively. The voltage transformer and current transformer collect voltage signal and current signal respectively, which were inputted deferentially to the ATT7022A voltage channel and current channel, to achieve electric energy information input and processing. The special measure chip ATT7022A measures the three-phase active power, reactive power, apparent power, active energy and reactive energy to meter and operate electric energy. MCU system processing module communicates with ATT7022A chip via the SPI bus interface by using the 16 bit MSP430F149 microcontroller. The establishment of database model and database table using the relatively practical method of entity-relationship achieves PC internal data memory module. In addition, the fabrication of PCB circuit board and software writing are also introduced in detail in this paper.

Keywords: machine tool, power monitoring system, MSP430F149

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Analysis of Selected Aspects of Turned Bearing Rings Regarding Required Workpiece Quality

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An article deals with an analysis of selected aspects of heat-treated bearing rings during machining and comes up with a solution (a machining operation) leading to improving efficiency of a machining process (i.e. an elimination of a generally expensive cutting technology when the same surface integrity is kept) lying in the series of samples that would be tested experimentally under university conditions (a workroom C2 of Department of Machining Technology FSI VUT in Brno) using a CNC turning lathe SP 280 SY.
A theoretical part focuses on a characteristics and analysis of a given component including an applied material 100Cr6 from which bearing rings are made. A practical part deals with an analysis and evaluation of a residual tension in a surface layer (Barkhausen noise: BN) using the device Rollscan 350. The article also comes up with a solution of an issue of surface integrity after a turning operation of bearing rings. The surface integrity is analysed with a touch measuring device (the device with an inductive sensor Form Talysurf Intra – Taylor Hobson) and a contactless device Talysurf CCI Life – Taylor Hobson.
The article ends with an analysis and evaluation of assessed aspects applied during turning of heat-treated bearing rings regarding the required workpiece quality.

Keywords: Bearing Rings, 100Cr6, Turning Operation, Workpiece Quality, Surface Integrity, Residual Tension

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Effect of Technological Parameters on the Heat Transfer Coefficient in Alloy AlCu4Ti using Squeeze Casting Technology

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The paper deals with the methodology of heat transfer coefficient measuring while using squeeze casting process. The casting with crystallization under pressure was used, specifically direct squeeze casting method. The pressure applied to the melt causes a significant increase (up to ten times) of the coefficient of heat transfer between the casting and the mold. The paper deals also with obtained results of the measured temperatures in the mold and the casting. The goal was to affect crystallization by pressure with value 100 MPa. On the basis of the measured variables were calculated values of heat flux between casting/mold, and consequently also the values of heat transfer coefficient.

Keywords: AlCu4Ti alloy, heat transfer coeficient, squeeze casting, heat flux

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The Mechanics of Machining Ultrafine-Grained Grade 2 Ti Processed Severe Plastic Deformation

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Machining of titanium is quite difficult and expensive. Heat generated during the process of cutting does not dissipate quickly, which affects tool life. In the last decade ultrafine-grained (UFG) titanium has emerged as an option for substitution for more expensive titanium alloys. Extreme grain refinement can be readily performed by severe plastic deformation techniques. Grain refinement of a material achieved in this way was shown to change its mechanical and physical properties. In the present study, the microstructure evolution and the shear band formation in chips of coarse grained and UFG titanium machined to different cutting speeds and feeding rates was investigated. It was demonstrated that an improvement in the machinability can be expected for UFG titanium.

Keywords: Ultrafine-grained, Titanium, Machinability, Severe plastic deformtion

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Internal Damping Depending on the Deformation Amplitude Measured on Magnesium Alloys

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The article is aimed on the analysis of the internal damping changes depending on the amplitude of the magnesium alloys AZ31 and AZ91 in as cast state. In experimental measurements was used only resonance method, which is based on continuous excitation of oscillations of the specimen and the entire apparatus vibrates at a frequency which is near to the resonance. Starting resonance frequency for all measurements was about f = 20470 Hz. These mechanisms have been studied by ultrasonic resonant apparatus. Damping capacity of alloys is closely tied to the presence of defects including solute atoms, second phases and voids. The interaction between moving dislocations and point defects is one of the major internal damping mechanisms of magnesium alloys so the precipitates influence the damping capacity and contribute to damping properties.

Keywords: Vibration Amplitude, Deformation Amplitude, Magnesium Alloy, Internal Damping, Resonant Frequency

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Short Sisal Fibers Reinforced Epoxy Resins: Tensile Strength

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Composite materials synergistically combine the properties of their sub-phases. Among the most widespread group of composite materials include fiber reinforced composites - usually with a polymer matrix. Mechanical properties of fiber composites are used in a variety of industries. The fibers can be represented by synthetic fibers or natural ones. Advantage of natural fibers is that it is a renewable resource, they are inexpensive, have adequate mechanical properties, which, however, due to the biological material may vary substantially. Described contribution deals with the experimental description of the tensile strength of two epoxy resins filled with short sisal fibers - random orientation of the fibers with different length, i.e. 2 mm, 4 mm and 6 mm. This paper compares the composite systems prepared from epoxy resins with different viscosity (resins Glue Epox Rapid, Glue Epox Rapid F) by casting. The presence of short fibers of sisal without controlled interlayer statistically unchanged tensile strength in many cases, and also increased the modul of elasticity in all cases.

Keywords: Agave Sisalana, biocomposite, mechanical properties.

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The Application of Ultrasonic Levitation in the Rotor Support

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In order to enhance the stiffness of the gas film and increase the maximum speed of the rotor, this paper proposes an ultrasonic levitation structure with a cone type bidirectional supporting motor. The performance of the conical-type ultrasonic levitation support is analysed and tested according the relationship between the levitation force and levitation gap. Through theoretical analysis it is realised that the critical speed and vibration mode of the motor rotor is affected by the change of levitation gap in the ultrasonic levitation condition. The experiments with levitation gap and the maximum speed of the motor rotor show the structure can reduce the suspended gap, while simultaneously the maximum speed of the rotor is increased.

Keywords: Ultrasonic Vibration, Suspension Support, Squeeze Film, Suspension Clearance

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Contact Analysis of Silicone Rubber Rectangular Ring in the Automatic Tighten Assembly

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According to the uniaxial tension model and coulomb friction theory, by considering the nonlinear mechanical properties of rubber, the effect of deformation quantities of silicone rubber rectangular sealing ring on the assembly torque in tightening assembly process is researched in this paper. A stress-strain numerical model of silicone rubber rectangular sealing ring in small deformation range is established when tightening, on this basis, the numerical model is derived in deformation quantities of rectangular ring and assembly torque. Then having the torque-angle experiments by automatic tightening machine. The results show that, compared with the practical engineering experiment, the numerical model that reveals the relationship between the deformation quantities of the rectangular sealing ring and Assembly torque can reflect the effect of deformation on the assembly torque during the actual assembly process with great accuracy, which has a great reference value for the automatic assembly.

Keywords: Torque-angle; Coulomb friction; Stress-strain; Finite element method; Silicone rubber rectangular sealing ring

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