

## STRESZCZENIA

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**INFLUENCE OF DEFORMATION ON A LIFETIME OF WELDING TIPS OF RESISTANCE SPOT ELECTRODES**

The contribution deals with the influence of welding electrode tips deformation on their lifetime. The influence of material properties, production technology and the intensity of welding electrodes load on their lifetime are presented. The electrode tips of the most used type of CuCr1Zr alloy of three basic standard shapes before and after the process of welding are evaluated. The process of welding is realized with low, middle and maximum welding parameters on programmable pneumatic spot welding machine VTS BPK 20. The influence of welding parameters on chosen material characteristics of welding tips is observed. Through the use of upsetting test, dependency of forming strength and deformation of material on used technology of welding tip production is observed.

Milan ÁBEL, Ján VIŇÁŠ, Ľuboš KAŠČÁK, Dagmar DRAGANOVSKÁ  
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**METALLOGRAFIC ANALYSIS OF ELECTRODE MATERIALS FOR RESISTANCE SPOT WELDING**

The contribution deals with metallographic analyses of welding tip materials and workpieces used in their production. Microstructures of in practice most used alloys Cu for welding electrodes of resistance spot welding are evaluated. Alloys of CuCr1Zr, CuCoBe and CuBe2. Analyses of influence of alloying elements and production technology of the alloys on final properties of electrode materials are presented. The effort of producers is the maximum lifetime of welding tips on which many factors have influence during welding process. Used welding mode, material properties of the tips, technology of their production, sort and surface treatment of welded materials and so on.

Ali A. ASHRAF  
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**WEAR CHARACTERISTIC OF EXFOLIATED GRAPHITE NANO SHEETS/COPPER METAL MATRIX COMPOSITE**

Powder Metallurgy technique has been used to prepare composite samples made of exfoliated graphite nano sheets (EGNS) and graphite flakes (GF) of 1, 3 and 5 weight % with copper chips. Effect of both graphite and its size on morphological, mechanical, and tribological behavior of copper matrix composite has been investigated. Some unexpected characteristics have been identified due to the addition of graphite flakes and its exfoliated nano sizes with copper metal matrix. Nano-like grain boundary (NLGB) phenomenon has been reported. A decrease in hardness has been measured within the used weight fractions. Surprisingly, there was an increase in wear rates with an increase in wt% GF added to the copper matrix. In the case of EGNS, an increase in wear rate is reported for a weight fraction of 1%, which then decreases as more EGNS is added until it reaches approximately the same wear rate of pure Cu matrix at 5% EGNS. It is believed that the increase in wear at 1% EGNS is due to delamination domination theory. Measuring the counter part wear characteristics more deeply, evaluating the dispersion quantitatively, and explaining the delaminating theory of the EGNS/Cu metal matrix composites is recommended for future work.

Velina BOZDOUGANOVA  
University of Rousse, Bulgaria

**A QUADRILATERAL HYBRID-STRESS MACRO-ELEMENT WITH INCOMPATIBLE INTERNAL DISPLACEMENTS**

A quadrilateral macro-element, containing two-triangle elements, is developed by the hybrid-stress method with incompatible internal quadratic displacements. Stress approximation satisfies the energy compatibility condition. The element stiffness matrix is determined by the Hellinger-Reissner principle. Several test problems are used to compare displacement and stress solution accuracy of the proposed macro-element with published in the literature solutions.

Marino BRČIĆ, Marko ČANAĐIJA, Josip BRNIĆ  
Department of Engineering Mechanics, Faculty of Engineering, University of Rijeka, Croatia

### **STRUCTURAL MODEL OF A CARBON NANOTUBE**

In this paper a theory about single and multi walled carbon nanotubes and a suitable way for modeling them using finite element method is presented. Precisely, in order to model a carbon nanotube, first we have to describe and find a linkage between molecular mechanics system and structural mechanics system and then use those results and demonstrate them on example. A brief theory concerning MWNT is given, as well as a theory of modeling a connecting interface between layers, as a result of van der Waals interactions. Different loading conditions are used for example of single and multi walled carbon nanotubes under specific load. Results are compared with results given by the other authors.

Janette BREZINOVÁ, Anna GUZANOVÁ  
Faculty of Mechanical Engineering, Technical university of Košice, Slovakia

### **THE THERMAL BALANCE OF MECHANICAL SHOT PEENING PROCESS**

The paper deals with the temperature influence of substrate during shot peening with using of contact measure method by thermocouples. Identical results like in process of shot peening are possible to achieve by application of high-speed cold forming processes. Relative mass of energy absorbed by deformed material is reduced with increasing deformation degree. Heating measure depends on deformation condition, speed and degree of deformation.

Janette BREZINOVÁ, Anna GUZANOVÁ  
Faculty of Mechanical Engineering, Technical university of Košice, Slovakia

### **POSSIBILITY OF MECHANICAL DEPOSITION OF PROTECTIVE Zn COATINGS**

This paper presents actual investigation results of experiment that was oriented to the verification of the possibility of applying zinc on steel surface by blasting technology using zinc-coated cut wire. Suitable method for zinc layers deposition and evaluation of their corrosion resistance was determined. Accelerated laboratory tests with presence of SO<sub>2</sub> and long term working tests in atmospheric conditions was used. Creation of incoherent zinc coatings was established on the bases of metallographic and spectral analysis. Process of cold zinc by blasting is able to use as temporary anticorrosion protection of steel surface.

Mahmoud CHIZARI, Bin WANG, Mel BARRETT  
School of Engineering, University of Aberdeen, United Kingdom

### **INTRODUCING A FAILURE CRITERIA FOR A LIVING CELL DURING MICROINJECTION**

This paper presents finite element modelling of the deformation of a detached living cell subjected to microinjection and through the simulation, an investigation of the material properties of the cell components. The model is verified using images of the deformed cell as well as the measured penetration forces in the tests reported in open literature. It is hoped that the modelling in this context will help to quantitatively evaluate the mechanical properties of the cells, and in particular, the failure strain of the cell cortex when penetration occurs.

Krassimir DOTCHEV  
The Manufacturing Engineering Centre (MEC), Cardiff University, United Kingdom

### **RAPID MANUFACTURING OF CASTFORM PATTERNS FOR INVESTMENT CASTING**

Laser Sintering (LS) is a layer manufacturing technique and currently it is extensively used to produce concept models, functional parts, and also patterns for investment casting (IC). CastForm<sup>TM</sup> Polystyrene (CF) is a powdered material used for fabrication of IC patterns employing the LS process. The use of the CF material is one of the fastest and most cost effective Rapid Manufacturing (RM) routes to produce small quantity wax-like patterns for shell or flask IC. The manufacture of CF casting patterns constitutes two stages. The first is the building of a "green" part and second is its infiltration with wax. The accuracy of the patterns, and ultimately the final accuracy of the metal castings, is determined by the CF material properties and the applied process parameters. The factors affecting the accuracy of the CF patterns are investigated in this paper. In addition, different ways to improve the process accuracy are discussed. An analysis of advantages and limitations of this RM technique for IC patterns fabrication is provided.

Mariana DOTCHEVA, Huw MILLWARD  
University of Wales Institute Cardiff (UWIC), Cardiff, United Kingdom

### **OPTIMISATION OF UP- AND DOWN-MILLING PROCESSES FOR A CORNER FEATURE**

This paper presents the specifics of the two types of end-milling, up- and down-milling, in the context of process planning of a finishing operation for machining complex pocket features. An optimisation mechanism is used for a pocket type of end-milling operation with the aim of comparing the results from up- and down-milling when the same process constraints have been applied. Two sets of cutting conditions have been generated and analysed for each type of end-milling. The first cutting condition has constant parameters for the entire tool path, derived from the worst case of cutting, representing the usual process planning approach. The second set of cutting conditions represents the optimised process. The predicted results were verified through experiments. The optimised, measured cutting parameters, when machining the critical corner, accurately demonstrate the important changes in magnitude and direction of the radial cutting-tool deviation and surface error.

Mariana DOTCHEVA, Daniel THOMAS, Huw MILLWARD  
University of Wales Institute Cardiff, United Kingdom

### **DESIGN AND RAPID MANUFACTURE OF SELECTED CELLULAR TYPE STRUCTURES**

The work presented in this paper aims to explore the enhancements that the Selective Laser Melting technology can bring to the design, manufacture, and performance of cellular type structures. Cellular type structures possess valuable characteristics such as low density, high strength, good energy absorption, good thermal and acoustic properties. These advantageous characteristics make them industry desirable but the difficulties of producing them limit their applications. The capabilities of some metal cellular structures as fundamental elements for creating new internal material configurations for injection moulding tools has been evaluated. The preliminary investigation highlights the requirements and the feasibility of such structures for the purpose of injection moulding tooling. Lattice cellular structures appear to be mechanically competitive alternatives to prismatic honeycombs structures. It has been illustrated that lattice core of injection moulding can be capable of supporting significant structural and process loads while also could facilitating cross flow heat exchange.

Kazimiera DUDEK  
Rzeszów University of Technology, Poland

### **THE DECORATIVE PROPERTIES OF BURNISHED SURFACE LAYERS**

In this paper was presented a decorative properties of burnished surface layers. It was emphasized that except the most important functional properties, such as: increase fatigue strength, corrosion resistance or abrasion resistance the burnished surface layers receive the meaningful decorative properties. As the result of the one burnishing operation are realized aims: both increase mechanical properties and esthetic.

Andrzej DZIERWA, Paweł PAWLUS  
Rzeszow University of Technology, Poland

### **SELECTED PROPERTIES OF CHROMIUM COATING ELEMENTS AFTER SHOT PEENING**

The paper presents results of the experimental investigations concerning chosen properties of chromium coating in relation to specimens made from 41Cr4 steel (coating thickness about 25  $\mu\text{m}$ ) and finished by shot peening. It has been found that shot peening of chromium coating can improve level of fatigue strength and slightly increase its microhardness.

Miroslav GOMBÁR, Sergej HLOCH\*  
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### **ANODIC OXIDATION FACTORS ANALYSIS SIGNIFICANCE**

The paper deals with mathematical modeling of dependence between anodic oxidation factors in sulfuric acid and thickness of created layer  $\text{Al}_2\text{O}_3$ . By means of full factorial design were studied four independent variables the amount of sulfuric acid, aluminum, time and voltage. Results show the anodic oxidation factors significance and their effect to the layer thickness. It is the first step towards to the optimization of the eloxal process.

Grzegorz GORCZYCA

## **EFFECTIVE PROJECT MANAGEMENT**

*Projects taken in live give us opportunity to develop our business, experience, the constrains we are struggling keep us on track in achieving the goal. The road to success do not need to be hard and painful, base on solid fundament of business philosophy can be more effective. In effective chain of project management, the weakest link are people and wrong interpretation of business philosophy by them.*

Ivan G. GRABAR, E.G. OPANASYUK, E.V. ZABASHTA, Dima B. BEGERSKIY  
Zhitomir State Technological University, Ukraine

## **MATHEMATICAL MODEL OF MOTION OF PNEUMONIC TYRE ON DRY SOIL**

Mathematical model of motion of pneumatic tyre on dry soil, which takes into account the change of radius and rigidity of tyre is proposed. Experimental data of dependence of static radius of a tyre from tangent force are presented.

Attila HERDITZKY, Maria KICKOVA

## **LIFE CYCLE INCREASING OF MECHANICAL COMPONENTS USING THERMAL COATINGS WITH RECASTS**

This article concerned with proposition of friction and deterioration of functional components surfaces in adhesive deterioration area and contact endurance. It's centered for possibilities how to decrease deterioration and extend a life cycle of component choosing appropriate material, component surface adjustment, or abrasion-resistant coatings painting with expressively better properties against basic material.

Sergej HLOCH, Jan VALÍČEK\*, Katarína MONKOVÁ  
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## **EXPERIMENTAL ANALYSIS OF AISI 304 SURFACE IRREGULARITIES CREATED BY ABRASIVE WATERJET BY MEANS OF 3D OPTICAL MEASUREMENT**

The paper deals with experimental analysis of AISI surface irregularities created by abrasive waterjet by means of 3D optical measurement. The surface irregularities has been evaluated by static quality characteristics the arithmetic average height  $R_a$ , root mean square roughness  $R_q$  and peak to valley height  $R_z$  that has been obtained from 24 measurement traces. The surface irregularities have been measured by means of contactless optical method, namely by using an optical commercial profilometer MicroProf (FRT). The main emphasis is put on the analysis of results for defining the process of creation of a new surface generated by the stream of abrasive waterjet, including its geometric parameters and mechanisms of cutting tool-material interaction.

Andrey V. ILCHENKO, Elena V. ZABASHTA, Vladimir A. LOMAKIN  
Zhitomir State Technological University, Ukraine

## **CHANGE OF THE MOMENT OF INERTIA OF V-TYPE CRANK-CONNECTING ROD MECHANISM OF INTERNAL COMBUSTION ENGINE**

Mathematical model of change of equivalent moment of inertia of V-type crank-connecting rod mechanism of piston internal combustion engines from the angle of swing of crankshaft is proposed. All wide-spread schemes of V-type crank-connecting rod mechanisms are analyzed, and adequacy of the given models in KOMIAC-3D V8 system is checked.

Milenko JOKIC, Marko CANADIJA  
University of Rijeka, Croatia

## **PHYSICAL AND NUMERICAL MODEL OF THERMOMECHANICAL BEHAVIOR OF COOKING VESSEL**

The paper presents elements of balance laws of continuum mechanics necessary for proper modelling of cooking vessel. The problem at hand must deal with multiphysical behaviour that involves both thermal and mechanical model. Coupled nature of the problem is solved by the separation of problem into two sequential steps. First step is the thermal step that gives temperature distribution throughout the cooking vessel. Upon calculation of temperature field, stresses are calculated. The

mechanical phase involves calculation of permanent strains. Upon definition of physical model, constitutive model is briefly presented. The proposed procedure is verified on the one geometry of a cooking vessel.

Michail KARSHAKOV, Nely GEORGIEVA\*  
Rousse University „Angel Kanchev”, Bulgaria  
\*Technical College – Yambol, Bulgaria

### **DYNAMICS OF THE MOBILE TWO-SKIVING BLOCK IN THE HOLE'S CUTTING**

Because of the mistakes in the technological system, in the hole cutting by the mobile two-skiving block is given a fluctuation in the depth of cutting, respectively in the action forces. In the present work are established the dependence between force, operating over the mobile block through cutting and mutually disposition of the block and cutting hole in the plane of the measure's formation YOZ.

Michail KARSHAKOV  
Rousse University „Angel Kanchev”, Bulgaria

### **PARAMETERS OF THE CUTTING LAYERS WITH TURNING BY ROUND CUTTING INSERTS**

*Abstract: In this paper the motives of round cutting insert's using with machining of tubular surfaces by cutting are explained. Here works out dependences which present the relation between the area, physical and technological parameters of the cutting layer depending on the inserts' nose radius. Restrictive circumstances are showed in and they fix the mode of the cutting layer's section.*

Luboš KAŠČÁK, Emil SPIŠÁK  
Technical University of Košice, Slovak Republic

### **EVALUATIONS OF PROPERTIES OF CLINCHING AND RESISTANCE SPOT WELDING**

The paper deals with evaluation of properties of joints made by clinching and resistance spot welding. Clinching method is a relatively new technique of material joining which is beginning to find its place in the automotive industry as an alternative to resistance spot welding, especially in joining materials of different thicknesses and qualities and with various surface treatments. The advantages and disadvantages of clinching and the possibilities of its usage in the automotive industry are described in the paper. Deep drawn steel sheets of various thicknesses, qualities and various surface treatments produced for the automotive industry by U.S.Steel Ltd. were used for the experiments. Samples with single clinch joints, double clinch joints and samples with single resistance spot welded joints were prepared, whereby various combinations of thicknesses and qualities of joined materials were used. The influence of the sheet's position in clinching of materials of various thickness considering the active parts of the tool i.e. punch and die was observed. Consequently the carrying capacities of clinch joints and spot welded joints were evaluated and compared.

Michail KHEIFETZ, Sergey KOUKHTA, Gennady PREMENT, Sergey KLIMENKO\*  
Polotsk State University, Belarus  
\*Institute of Super Firm Materials it. V. Bakul, National Academy of Sciences of Ukraine

### **CHOICE OF DESIGN DECISIONS DURING MODELLING TRANSFER OF PARAMETERS OF QUALITY OF DETAILS OF MACHINES**

It is shown, that computer support of life cycle of products with use of CALS-technologies demands development of through mathematical models of inheritance of a complex of parameters of quality of products. At the automated designing intensive methods of processing of details of machines it is offered to use domination of properties of relations of technological decisions. On a basis synergetic the approach models of loss of serviceability of units of friction are considered.

Katarzyna KORZYNSKA  
Rzeszow University of Technology, Poland

### **A METHOD OF EVALUATING ENVIRONMENTAL ASPECTS IN THE ISO 14001 ENVIRONMENTAL MANAGEMENT SYSTEMS**

The article suggests a way of evaluating environmental aspect importance in the Environmental Management Systems which comply with the ISO 14001 standard. An appraisal is required by the ISO 1401 modal standard, which means the necessity of

evaluating environmental aspects in order to point out the significant ones. However, the standard does not say how to do it. This arises some problems for the organisations implementing the ISO 14001 requirements and this article can help to solve them.

Vasil KOSTADINOV, Michail K. KARSHAKOV  
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### **PROCESSING OF THE GROOVES THROUGH SURFACE PLASTIC DEFORMATION**

The processing of the grooves for a putting gaskets in the hydraulic holes is embarrassed because the high requirements for their precision and roughness. In this case like a method for finish processing it is suitable using surface plastic deformation. This method ensures as the quality of the machining surface as higher productivity.

Vasil KOSTADINOV  
Rousse University „Angel Kanchev”, Bulgaria

### **COMBINED TOOLS FOR SURFACE PLASTIC DEFORMATION WITH RADIAL FEED**

Like a method for a finishing processing, the surface plastic deformation improves the exploitation characteristics of the machining surfaces and increases their qualities. Moreover – it achieves sizable decrease of the machining times in comparison with the other finishing methods. The using of combined tools creates circumstances for simultaneously processing with the prior machining, which leads to augmentation of the machining productivity.

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### **AUTOMATED TECHNOLOGICAL EQUIPMENT LAYOUT IN INDUSTRIAL ROBOTS' WORKING AREA HAVING COMPLICATED SHAPE**

The conception and methods of computer-aided solution of flexible manufacturing cells technological equipment layout relative to industrial robot (IR) with optimization by a set of accepted criteria are presented. The software realization of this task for IR having working area (WA) of complicated shape is presented. The idea of surface analytical description of IR WA having complicated shape and interactive editor for its computer-aided forming are presented.

Kirill L. LEVINE, Jude O. IROH  
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### **INFLUENCE OF POLYPYRROLE ON CURING OF POLY (AMIC ACID)**

Polyimides are widely used in industry because of their excellent resistance to heat and very good mechanical properties. Electrically conductive polyimide composites are under focus of the research for application in electronics, aircraft and automobile industry. To prepare electrically conductive polyimides we used conjugated polymer: polypyrrole. The presence of conjugated double bonds in the composite resulted in intermolecular complexes with charge transfer. The presence of polypyrrole also affected an imidization temperature: the temperature of poly(amic acid) conversion to polyimide. In this paper imidization of poly(amic acid) was investigated by Fourier transform infrared spectroscopy, and differential scanning calorimetry. Morphological changes in polypyrrole/polyimide composite were studied by scanning electron microscopy. Results were explained by conformational changes in poly(amic acid) under the influence of polypyrrole.

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### **THE SUGGESTION OF NEW MANUFACTURING TECHNOLOGY FOR HAND-MADE SCREW BLADE FOR WIND-POWER PLANT**

The contribution deals by the suggestion of new manufacturing technology for hand-made screw blade for wind-power plant with complicated topology that exists without the drawing documentation. To obtain the dimensions of such undefined real part is often very difficult, especially, if the accuracy requirement is great. The automation of the manufacturing of hand-made prototypes is one of the main goals in present days what is enabled by the quick development of information technology and by the sequential application of computer aid into all areas of the production.

Irena NOWOTYŃSKA  
Rzeszów University of Technology, Poland

### **THE USE OF NUMERICAL IMAGE ANALYSIS FOR DETERMINE OF STRAIN DISTRIBUTION IN LAYERED COMPOSITES DURING EXTRUSION**

The possibility of application of numerical image analysis for determine of strain distribution in layered composites in the extrusion process was presented. Commercially available an ASAME (Automated Strain Analysis and Measurement Environment) program has been used. Basing on experimental study of layered composite extruded through different dies and use of the grid distortion method, strain distribution using ASAME program was presented.

Pavol PAPCUN, Daniel JANKURA  
Technical University in Kosice, Slovakia

### **STRUCTURE AND ADHESIVE PROPERTIES OF CERAMIC AND COMPOSITE COATINGS ON AL<sub>2</sub>O<sub>3</sub> BASE**

Paper deals with application of new composite powder materials, which are prepared by heating sprayed with plasma with water stabilized arc. Investigated coating powder material is on ceramics (Al<sub>2</sub>O<sub>3</sub>) - metal (Ni) base. Ceramic sand composite coatings were deposited on substrate of steel 11 373 (ISO 630 - 80). Adhesive - cohesive of properties was used norm STN EN 582 – Determination of tensile adhesive strength. The adhesive test showed, that composite coatings with nickel, reach better adhesion.

Masud M. PARVEZ, Mojahidul HQUE, Tamas SZECSEI  
Dublin City University, Ireland

### **A STUDY OF DIFFERENT MANUFACTURING FEATURE RECOGNITION METHODS**

To represent 3-D objects properly, several types of techniques have been developed in the field of solid modeling. Solid modeling techniques describe 3-D products and in recent year we have seen a growth by the rapid multiplication of solid modelers and 3-D CAD systems. The geometric elements of the solid model will be analyzed and features those are recognized as manufacturing entities will be extracted and organized according to topological manner. To detect manufacturing information from solid models produced by computer-aided design (CAD), feature recognition technique is used that focuses on the design and implementation of algorithms. Automatic feature recognition (AFR) technique is an important tool for achieving a true integration of design and manufacturing stages during the product development, and considered to be a critical component for integration of CAD and CAM. This paper is concerned with the overview of different feature recognition research focusing on four of the major feature recognition algorithmic approaches. Detailed description of algorithm for each approach will be presented along with some examples.

Paweł PAWLUS, Andrzej DZIERWA  
Rzeszów University of Technology, Poland

### **FUNCTIONAL IMPORTANCE OF SURFACE TOPOGRAPHY PARAMETERS**

The paper presents the review of research investigations concerning functional importance of different surface topography parameters. The results of own investigations are also taken into consideration. Four groups of parameters were analysed: amplitude, spatial, hybrid and connected with material ratio curve.

Alexandre POLOZINE, LÍrio SCHAEFFER  
Federal University of Rio Grande do Sul, Brazil

### **TESTING OF THERMOCOUPLES IN THE HIGH GRADIENT TEMPERATURE FIELD**

Two identical thermocouples were placed in the fields of different temperature gradients. The comparison of thermocouple readings revealed that the traditional method of temperature measurement is unfit for high gradient temperature fields.

Agáta RADVANSKÁ, Sergej HLOCH  
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### **EXPERIMENTAL ANALYSIS OF THE DUST AT PLASMA CUTTING**

The paper deals with the elimination of negative aspects of plasma cutting by means of emission exhausting and filtration. The point of the technology application is to minimize the worker exposure as well as the environmental pollution. Plasma cutting technology is characterized by high operation costs, mainly high energy consumption, gases consumption, as well as device wear. In addition, it has negative impact on the working environment by its noisiness, UV radiation emissions and last but not least by harmful substances emissions. These last consist of metallic oxides and toxic gases. It is necessary to exhaust them right after they are generated and filter them from the exhausted air to avoid the environment impairment. One of the noxious dusts elimination methods is the application of the proper type of patron filter that would be able to separate the dusts.

Ján SLOTA, Ivan GAJDOŠ  
Technical University of Košice, Slovakia

### **THE APPLICATION OF RAPID PROTOTYPING, CAE AND CAM METHODS IN PRODUCT DEVELOPMENT PROCESSES**

In order to shorten manufacturing time for new products and their moulds, the use and the development of modern techniques are critical. One of such technologies is the rapid prototyping method, which enables to designers and customers to see the physical presentation of a new product. Application of the CAE methods is accentuated in the development phase of the product, which redounds to cost reducing on tools and moulds development. The paper deals with several steps in prototype development, the application of computer simulation by means of CAE system Moldflow MPI in mould development for mold plastic part and utilization of CAM system for NC programming of the mould manufacturing.

Victor SPUSKANYUK, Alexander DAVIDENKO, Alexander GANGALO  
Donetsk Institute for Physics and Engineering named after O.O.Galkin of the National Academy of Sciences of Ukraine

### **NEW METHOD OF CALCULATING THE EQUAL CHANNEL ANGULAR EXTRUSION PRESSURE**

New method of calculating the equal channel angular extrusion (ECAE) pressure is introduced. Calculation of the pressure is produced by using friction factor of Siebel. This method of pressure calculation is proposed for ECAE of short billets and for the equal-channel angular hydroextrusion.

Wiktor SHABAJKOWITCH  
Rzeszow University of Technology, Poland

### **A NEW APPROACH IN DEVELOPMENT OF TECHNOLOGICAL PROCESSES**

It is necessary to bring in additional stages in the method for development of the technological processes in manufacture and assembling of details, which are linked with the use of technological heredity and the use of effect self-organization and the purpose of directed forming of the rise indexes of quality products.

Slawomir SWIRAD  
Rzeszow University of Technology, Poland

### **THE EFFECT OF BURNISHING PARAMETERS ON STEEL FATIGUE STRENGTH**

The possibilities of sliding burnishing with cylindrical elements made of diamond composite with ceramic bonding phase are presented in this paper. The influence of some parameters of sliding burnishing on fatigue strength of 401Cr4 steel is also included.

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\*Technical University of Kielce, Poland

### **ANALYSIS OF SELECTED PROPERTIES OF DLC FILMS**

This paper is oriented to the study of advanced materials on the base of - DLC (diamond like carbon) coatings – namely a: C (amorphous carbon films). The type and thickness of deposited coatings by PVD method can influence their quality and



adhesion to the substrate. PVD process parameters are strongly affecting the coatings and substrate interface as well as the adhesion and tribological properties. Experimental samples were made of commercial CrMoCo alloy-substrate system used for artificial joints. Amorphous carbon layers were deposited by equipment UVNIPA-1-001. The wear resistance of the coatings was evaluated by microtribotest and DSI curves measured by the NanoTest NT 600 apparatus at different maximal loads from 5, 10, 20, 50, and 100 mN with diamond Berkovich tip using the analysis developed.

Pavel TOPALĂ \*, Laurențiu SLĂTINEANU \*\*, Oana DODUN \*\*, Natalia PÎNZARU\*

\* State University "Alecus Russo" of Bălți, Republic of Moldova

\*\* Technical University „Gh. Asachi” of Iași, Romania

## **INFLUENCE OF SOME FACTORS ON THE POWDER DEPOSITION PROCESS BY ELECTRICAL DISCHARGES**

The paper presents the results of some experimental researches concerning the electrical discharges deposition of the metallic powders on the workpieces cylindrical surfaces. The process could be included in the group of the manufacturing processes based on the physical effects of the electric current. The powder is introduced in the electrical discharge channel developed between the workpiece and the electrode. As consequence of the high temperature developed within the discharge channel, the powder and the superficial layer of the workpiece are melted and they constitute the new metallic layer, presenting more convenient properties from the point of view of the part behavior in service. Adequate mechanical and electric equipment was used to ensure the work conditions for the electrical discharge deposition. The experimental researches were developed to study the influence exerted by certain work conditions on the mass of the deposited material.

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## **IDENTIFICATION OF SURFACE TEXTURE CREATED BY THE ABRASIVE WATERJET AND A PROPOSAL FOR CRITERIA FOR ITS EVALUATION**

The submitted contribution deals with the identification of texture of metal surfaces produced by the abrasive waterjet with the aim to increase surface quality. To the measurement of surface irregularities, a developed contactless shadow method was applied. A dimensionless statistical parameter  $C_{Ra}$  for experimentally tested metal materials has been derived the discrete value of which will contribute, in the automated on-line system of feedback, to the optimization of traverse speed of the cutting head, i.e. that technological factor which influences the quality of machined surfaces most.

Alexandr VASILIEV\*, Michail KHEIFETZ, Sergey KOUKHTA, Gennady PREMENT

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Polotsk State University, Belarus

## **FORMATION OF QUALITY INDEXES OF MACHINE DETAILS ON THE BASIS OF TECHNOLOGICAL INHERITANCE**

*From positions of technological inheritance of operational parameters actions on quality management of products of mechanical engineering are offered. The mathematical model of inheritance of quality indexes in life cycle of the product, describing various modes of behavior is developed by manufacture and application of technical systems. Use of mathematical model at computer designing gives ample opportunities for reduction of expenses at manufacturing and operation of constructive - complex products of mechanical engineering.*

Ján VIŇÁŠ, Ľuboš KAŠČÁK, Dagmar DRAGANOVSKÁ, Milan ÁBEL

Technical University of Košice, Slovakia

## **THE CHOICE FACTORS ANALYSIS INFLUENCING QUALITY OF MIG BRAZED JOINTS OF GALVANIZED STEEL SHEETS**

In the paper results of metallographic analyses of joints made by MIG brazing on deep-drawn galvanized steel sheets of DC 05 EN 10152 are presented. The quality of brazed joints made by SG CuSi3 and SG CuAl8 braze with fluctuating welding rectifier CLOOS 303 MC4 was evaluated. Argon 4,80 was used as gaseous shield.

Eva ZDRAVECKÁ, \*Jaroslav BRIANČIN, Štefan FECSU  
Technical University of Kosice, Slovakia  
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### **ANALYSIS OF SELECTED PROPERTIES OF PVD FILMS**

Thin ceramic coatings deposited on the surface of tools and machine parts by PVD methods improve considerably their tribological properties. These hard brittle coatings can be damaged rapidly if a plastic deformation initiates in the substrate near the coating-substrate interface when subject to a relatively high intensity loading. The load bearing capacity of the coating-substrate system increases with improved substrate properties. The typical duplex process involves thermo-chemical treatment and the PVD coating treatment of steels. Tested duplex treated low-alloy steels were pulse plasma nitrided and then coated by CrN. The fretting tests showed the high wear resistance of duplex treated steel.

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### **COAL POWDER FRACTIONS DISTRIBUTION IN THERMAL POWER PLANT MIXTURE CHANNEL PRESENTED BY NUMERICAL CALCULATIONS**

One of the problems during exploitation period of thermal power plant is to determine and optimize distribution of various coal powder fractions in the mixture channel. Regulation of distribution with shutters, positioned after the mills, is proposed solution. The paper present distribution of coal powder fractions, obtained by numerical calculations, using numerical software for modelling of two-phase flow problems. The problem is two-dimensional, considering that, transversal dimension of the domain is relatively big compared with the other two dimensions, and volume occupied by solid phase is much less than volume occupied by continual phase. Continual phase is treated by an Eulerian approach, and solid phase is modeled by Lagrangian approach. The model takes in consideration coupling of phases by PSI-CELL method. Turbulence was modeled with standard  $k-\varepsilon$  model. The model treats particles as an ideal sphere. In order to determine particle movement, all relevant forces, (with continual affect and impulse affect), are incorporated in the model. The results obtained, include velocity field and profiles of continual phase, concentration field and profiles of coal particles and mass flow distribution at the outlet cross section of mixture channel for various coal particle diameters and various angular positions of shutters.