

ȘTEFAN CEL MARE UNIVERSITY of SUCEAVA
FACULTY of MECHANICAL ENGINEERING, MECHATRONICS AND
MANAGEMENT
DEPARTMENT of TECHNOLOGY AND MANAGEMENT

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CONTENT:

1. MECHANICAL DOWNSTREAM PROCESSING OF SINGLE CELL OILS	7
De CONINCK M., MERCKX D., VAN HECKE R., DEPREZ K.	
2. PERFORMANCES OF ROUND CLINCH PROCESSED BY THE JOINING SHEET METAL IN ONE-PIECE-DIE.	11
Lucian V. SEVERIN, Traian Lucian SEVERIN	
3. RESEARCH CONCERNING THE INFLUENCE OF HEAT TREATMENT ON PHYSICAL AND MECHANICAL PROPERTIES OF ALUMINIUM BASED ALLOYS	17
Elisabeta VASILESCU, Marian NEACSU. Elena DRUGESCU	
4. STUDIES FOR THE AUTONOMUS SELF – GUIDANCE OF LEGGED / WHELLED SYSTEMS	21
Mário António RAMALHO	
5. INFLUENCE OF MILLING DIRECTION ON THE SURFACE ROUGHNESS AT DIFFERENT TOOL AXIS INCLINATION ANGLE IN BALL END MILLING OF OLC45 (C45) MATERIAL	28
Ioan PAȘCA, Mircea LOBONȚIU	
6. DESIGN AND FUNCTIONAL SIMULATION OF PYROTECHNIC ROBOT MECHANISMS	35
Ionel STARETU	
7. STAND FOR PARAMETERS SETTING AND MONITORING THE ULTRASONIC WELDING AND INSERTING PROCESSES	41
Doru Virgil PĂUȘAN, Victor POPOVICI	
8. THE INFLUENCE OF QUENCHING MEDIUM ON THE DUAL-PHASE FERITO-MARTENSITE STEEL WITH 0.09% C 1.90% Mn	47
Constantin DULUCHEANU, Nicolai BĂNCESCU, Traian Lucian SEVERIN	
9. WEIBULL ANALYSIS USING R, IN A NUTSHELL	52
Jurgen SYMYNCK, Filip DE BAL	
10. HARDNESS VARIATION OF ELECTROCHEMICALLY DEPOSITED NI - W ALLOY WITH DIAMOND POWDER	59
Traian Lucian SEVERIN, Maria POROCH-SERITAN, Gheorghe GUTT	
11. INFLUENCE OF THE TMCP AND HEAT TREATMENTS ON THE STRUCTURE AND MECHANICAL CHARACTERISTICS OF MICROALLOYED STEEL PLATES	64
Elisabeta VASILESCU, Marian NEACSU, Alexandru CHIRIAC	
12. STUDY OF THE INFLUENCE OF THE MODIFICATION OF THE CARBON ON THE SHEET MECHANIC CHARACTERISTIC	68
Silvia MIRONEASA, Costel MIRONEASA	

<p>13. AUTOMATIC GENERATION OF THE REGRESSION FUNCTION IN THE CASE OF DRILLING, USING SPECIAL STEELS P. C. PATIC, A. VLASE, L. PASCALE</p>	72
<p>14. TEMPERATURE'S VARIATION IN THE RAMIFIED STRUCTURES Delicia ARSENE, Claudia BORDA, Marinela MARINESCU, Larisa BUTU, Gheorghe ARSENE</p>	78
<p>15. HARDENING U.S. AND RETAINED AUSTENITE IN BEARING STEEL Nicolai BĂNCESCU, Constantin DULUCHEANU</p>	82
<p>16. PRACTICAL EXPERIENCE OF USING CHEMICAL VAPOUR DEPOSITION COATINGS TO RESIST WEAR Stela CONSTANTINESCU</p>	86
<p>17. ELECTROCHEMICAL DEPOSITION METHOD TO OBTAIN COMPOSITES COATINGS WITH METAL MATRIX Olga MITOSERIU, Stela CONSTANTINESCU, Lucica ORAC</p>	90
<p>18. STRUCTURAL ANALYSES OF BORON NITRIDE THIN FILMS Stela CONSTANTINESCU</p>	94
<p>19. GPALM: A SIMPLIFIED ACCELEROMETERBASED VIRTUAL KEYBOARD Ilias SARAFIS, Anastasios MARKOULIDIS</p>	98
<p>20. THE PLANNING OF SOME INTELLIGENT VEHICLES Romeo IONESCU, Valeriu LUPU</p>	108
<p>21. EXPERIMENTAL RESEARCH ON REINFORCED POLYMER COMPOSITES WITH FIBERGLASS GAUZE Mihai GRAMATICU</p>	114
<p>22. AN INTELLIGENT SYSTEM SEARCH FOR INDOOR REFERENCE POINTS FOR LEGGED OR WHEELED SELF GUIDED SYSTEMS Mário António Ramalho</p>	118

MECHANICAL DOWNSTREAM PROCESSING OF SINGLE CELL OILS

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Abstract: Harvesting and the recovery of interesting products from microalgae is one of the most problematic areas of algal biofuel production technology. The traditional downstream process, nowadays used in the food and feed industry, runs up to more than 50% of the total production cost of Single Cell Oils (SCO). This research is focused on the development of a simple, robust and economical feasible mechanical downstream process set up for the commercial production of SCO. An efficient yield technique to extract the biomass from its growing medium and the disruption of the harvested cells are the main focuses. Two algae model organisms with different properties were selected: *Phaeodactylum tricornutum* and *Nannochloropsis* sp.

In this study crossflow (micro)filtration is investigated as an alternative for the concentration of the fragile cells. As a result of these tests, crossflow filtration seems to be a suitable technology to concentrate algae up to around 60-70%. Also harvest time, capital cost, consumable cost, ease of scalability and process robustness of the technique are kept under consideration.

Keywords: *single cell oils (SCO), crossflow filtration, membranes, optimization, algae*

PERFORMANCES OF ROUND CLINCH PROCESSED BY THE JOINING SHEET METAL IN ONE-PIECE-DIE.

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Abstract: The paper presents the clinching joint and some experimental determinations of the resistance performances of round clinch processed in one-piece-die. The experimental research was made on the different sheet steel thickness fastened and was mechanically tested the clinching point in transversal and axial direction with shear tensile test pieces and peel tensile strength pieces. Also, it is presented experimental determinations and the performances of joint after the repressing operation. It was obtained same results with practice utility concerning press joining steel and resistance of joint clinched depending on sheet thickness and diameter size.

Keywords: *clinching, joining sheet metal, cold forming.*

RESEARCH CONCERNING THE INFLUENCE OF HEAT TREATMENT ON PHYSICAL AND MECHANICAL PROPERTIES OF ALUMINIUM BASED ALLOYS

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Abstract This work presents the experimental results concerning the behavior on heat treatment of on aluminum based alloy belonging to the class of aluminum alloys deformable and harden by heat treatment.

The laboratory level experiments effected on samples of Al-Zn alloy illustrate the variation of properties depending on the variation of heat treatment technological parameters specific to different variants of heat treatment. In view of the chemical composition of the studied alloy and being aware of the fact that the structure and composition of this type of alloys depend on the proportion Zn/Mg, on the copper and magnesium content as well as on the elements sum(Zn+Mg+Cu), we have experimented more variants of heat treatment in order to establish the optimal variant and to classify the studied alloy according to its use characteristics(high, medium or low strength).

Keywords: *heat treatment, quenching in solution and heat ageing, aluminum based alloy.*

STUDIES FOR THE AUTONOMUS SELF – GUIDANCE OF LEGGED / WHELLED SYSTEMS

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Abstract: Driverless vehicles are coming to our lives. Some driverless vehicles are already in commercial exploitation today, e.g. trains. However the use in a non-isolated environment or in shared environments is still a problem. One of such examples is industrial environment, where, some areas can be allocated to vehicles. The exclusive use by vehicles pose difficulties to the floor plan lay out. The present research is to promote a collaborative environment for driverless vehicles, where they can search, take and share information and leave it at disposal for others. Our approach for a vision-guided vehicle is to rely on a virtual reality representation of the environment in order to work as a pattern generator for image analysis. This environment can be shared and used by multiple users, allowing them to correct and increment their knowledge of the environment. In the present paper a novel network is analyzed, intended to aid visual environment analysis, who acts as shared memory framework to all intervenient.

Keywords: *Retinex color self-guided image processing*

INFLUENCE OF MILLING DIRECTION ON THE SURFACE ROUGHNESS AT DIFFERENT TOOL AXIS INCLINATION ANGLE IN BALL END MILLING OF OLC45 (C45) MATERIAL

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Abstract: Ball end milling has a relatively high share in the cutting process. Due to the widespread use of this process is essential to know the parameters that can influence the process to achieve the optimum and adequate quality of machined surface. Besides the cutting regime parameters for milling operations with ball nose end mills the angle of inclination of the cutting tool axis has a great importance. The present paper includes a summary of international investigation and optimization of surface quality depending on the parameters involved in the process and in particular the inclination of tool axis.

Keywords: milling, roughness, inclination angle, direction.

DESIGN AND FUNCTIONAL SIMULATION OF PYROTECHNIC ROBOT MECHANISMS

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Abstract: Pyrotechnic robots are service robots used to reduce pyrotechnic troops intervention time and danger in the case of operators. The main mechanical components of a pyrotechnic robot are three complex mechanisms: mechanical mobile platform; robotic arm and gripping mechanism. In the paper, structure, kinematics, static synthesis and analysis, design and functional CAD and virtual simulation are depicted on a robotic arm and the grippers attached from a pyrotechnic robot designed under the author's coordination.

Keywords: pyrotechnic robot, design, functional simulation, virtual simulation

STAND FOR PARAMETERS SETTING AND MONITORING THE ULTRASONIC WELDING AND INSERTING PROCESSES

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Abstract: The paper presents an assay stand which permits the control of the frequency and the amplitude of the ultrasonic oscillation, of the static force and of the duration of the ultrasonic welding and inserting processes. The stand has a resistive tensometric acquire device used for measuring the static force, a power supply which allows the activation tension setting of the piezoceramic transducer which leads to the modification of the ultrasonic stack oscillation amplitude and a temporizer for process duration setting. All parameters are monitor both on classical devices and virtual instrumentation.

Keywords: piezoceramic transducer, inserting, static force, accelerometer

THE INFLUENCE OF QUENCHING MEDIUM ON THE DUAL-PHASE FERITO-MARTENSITE STEEL WITH 0.09% C 1.90% Mn

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Abstract: In this article, the authors present the quenching medium influence on the structure of dual-phase ferito-martensite steel with 0.09% C and 1.90% Mn. The intercritical heat treatment consisted of heating to 740°C and maintaining for 30 minutes and then cooling in water, oil, oil in magnetic field of continuous current and oil in ultrasonic field. They determined the percentage of martensite in the structure, density of dislocations, the carbon dissolved in martensite, the degree of its tetragonality and quantity of residual austenite as well.

Keywords: *dual-phase steel, quenching medium.*

WEIBULL ANALYSIS USING R, IN A NUTSHELL

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Abstract: This article gives a very short introduction to fatigue and reliability analysis using the two-parameter Weibull model. To gain expert insight in the inner workings of commercial analysis packages such as Reliasoft's Weibull++ and superSMITH Weibull, the authors created an open source alternative with a subset of analysis tools and made it freely available as an Open Source package for the R statistical software. This article explains briefly how to use the software, how Weibull plots are generated and how conclusions can be drawn. For the complete and most recent version of this document, check ref. [1]. For more in-depth treatment of the subject, check ref. [2].

Keywords: *Weibull, R, open source software, fatigue, reliability, analysis*

HARDNESS VARIATION OF ELECTROCHEMICALLY DEPOSITED NI - W ALLOY WITH DIAMOND POWDER

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Abstract: *Tungsten alloys are known for their excellent mechanical and tribological properties. The paper presents the research on the characteristics, in terms of Vickers hardness for the alloy deposits obtained by nickel, tungsten and diamond powder co-depositions in a mixed galvanic bath. The bath containing nickel and tungsten salts and diamond powders of various size, maintained in suspension by stirring of the bath solution. The Vickers hardness was achieved according to the following working parameters: current density, the stirring of the galvanic bath, the secondary distribution of current (expressed by the anode - cathode distance) and the diamond particle size. Also in this paper is presented some aspects studied by scanning electron microscopy (SEM).*

Keywords: *nickel, tungsten, alloy, diamond particles, hardness, microscopy.*

INFLUENCE OF THE TMCP AND HEAT TREATMENTS ON THE STRUCTURE AND MECHANICAL CHARACTERISTICS OF MICROALLOYED STEEL PLATES

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Abstract: This paper presents the results industrial and laboratory scale researches regarding the influence of the main technological parameters of the TMCP processing on the structure and mechanical characteristics of microalloyed steel heavy plates. There are also presented the results obtained by classical thermal treatments which make possible a comparative study of the structural changes and mechanical properties obtained through normalizing, controlled rolling, thermomechanical treatments for some steel grades for heavy plates used in the production of large pipes lines.

Keywords: *heavy plates, microalloyed steels, mechanical characteristics, heat treatments, thermomechanical treatments.*

STUDY OF THE INFLUENCE OF THE MODIFICATION OF THE CARBON ON THE SHEET MECHANIC CHARACTERISTIC

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Abstract: The carbon from the structural composition of the metallic material influences the strain traction, the yield and the elongation after the braking percent. The paper describes the influence that the decrease of the carbon percent with 0,1% and 0,2% has. The tests were realized on thin sheet specimens with same compositions for the main chemical elements (Mn, Si, S și P). The decrease of the carbon percent influences in the same way the strain traction and the yield and increases the value of the elongation after braking percent.

Keywords: *mechanical characteristics, chemical composition, sheet, tensile tests*

AUTOMATIC GENERATION OF THE REGRESSION FUNCTION IN THE CASE OF DRILLING, USING SPECIAL STEELS

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Abstract: Starting with drilling function and moments expression, which is often applied in most of the literature books and taking into account mathematical procedures, the axial forces and splinting moments are calculated by using drilling regime parameters of four types of special steels (heat resistance steels). Using the mathematical relations established and the MathCAD software, cutting forces and moment expressions curves, varying cutting regime parameters are generated during the drilling processing. Some diagrams which are obtained as a result of the research presented can be useful in cutting process optimization.

Keywords: *Experimental, Analytical, Graphical determinations, Heat resistance steels, MathCAD.*

TEMPERATURE'S VARIATION IN THE RAMIFIED STRUCTURES

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Abstract: This paper work is meant to demonstrate the capacity of the fractal objects surfaces, with complex configurations, which are able to store and traffic a large amount of information. In this respect, we investigated ramified dendrites, by infrared thermograph. The dendrites were obtained by electro deposit procedure from a copper sulphate solution.

Keywords: fractal, infrared thermograph

HARDENING U.S. AND RETAINED AUSTENITE IN BEARING STEEL

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Abstract: The presence of retained austenite in the structure of the bearings elements affecting both fatigue resistance and dimensional stability over time. The research followed the influence of hardening conditions on the residual content austenite a bearing steel substructure.

Keywords: heat treatments, hardening, retained austenite.

PRACTICAL EXPERIENCE OF USING CHEMICAL VAPOUR DEPOSITION COATINGS TO RESIST WEAR

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Abstract: The prevailing tool- coating technique nowadays is the vapor chemical deposition (CVD) According to this procedure which is carried out at 800 C-1220 C, more plates in each charge can be coated simultaneously the layers obtained being smooth on all sides, continuous, featuring good adherence to the sub-layer and suitable surface rugosity The Titan nitride (TiN) is deposited as layer of ultra-fine granulation on all the sides exposed .

This is also shown by the gradients durability vs cutting speed , $T=f(v)$ which is smaller when processing white cast iron than steels .

Keywords: *deposition, cutting, layer.*

ELECTROCHEMICAL DEPOSITION METHOD TO OBTAIN COMPOSITES COATINGS WITH METAL MATRIX

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Abstract: Electrochemical deposition provides a simple and easily controllable method to obtain composites coatings with metal matrix and ceramics as disperse phase. The ceramics to be found in the electrolysis solution as a suspension of particles with size in the ranging from 0,1 to 50 μm , are codeposited while the metallic irons are reduced . Weight percentage of the disperse phase up to 35 – 40 % can be obtained. The investigations carried out by our group have mainly tried to :

- Obtain composite coatings of Cu-SiC, Fe-SiC and Co-CeO₂ by electrodeposition
 - Optimise the desired technological properties by varying several parameters (current density, stirring, temperature, concentrations of the disperse phase, nature of the electrolyte) .
- A comparative microscopic study of the composite coatings and the pure metals reveals important morphologic differences .

Keywords: *composite, ceramics, deposition, microscopic.*

STRUCTURAL ANALYSES OF BORUM NITRIDE THIN FILMS

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Abstract: The present paper deals with obtainment and study of the chemical vapour deposition formed borum nitride coatings on widia substratum . The experiments conducted to obtain thin layer of nitruce by the vapor chemical deposition method have followed an original path to make BN directly in the working room thus avoiding the import of these hazardous substances. The borum nitride is obtained in the heat treatment chamber by adding chloride acid vapors passed over the incandescent pure Borum or ferroborum. The support temperature was established at about 1030° C so that the BN can provide a suitable deposition of the thin BN layer.

Lab-scale systems have been designed with the possibility of use at industry scale for small production.

Very good results were obtained for four hours ' exposure times leading to optimum layer thickness of 8µm .

Keywords: *film, deposition, thickness.*

GPALM: A SIMPLIFIED ACCELEROMETERBASED VIRTUAL KEYBOARD

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Abstract: In this paper we describe a novel accelerometer-based virtual keyboard incorporating only two 3-axis wireless sensors, one for each hand. X-Y-Z palm acceleration data are acquired and analyzed by an algorithm specifically developed for gesture recognition. User mimics the traditional two hands typing, but in an arbitrary surface and in a simplified manner, i.e. using only nine multi-letter virtual keys per hand. A disambiguation lexicon-based algorithm is then used to predict the typed word from a built-in

dictionary. Special gestures for non-text characters are also mapped and recognized. The system can be used in any application requiring zero form factor and minimized or no contact with a medium, as in a large number of cases in human-computer interaction, virtual reality, game control, 3D designs etc.

Keywords: *virtual keyboard, accelerometers, text entry, input devices.*

THE PLANNING OF SOME INTELLIGENT VEHICLES

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Abstract: In this article it was presented an application with intelligent machines. The intelligent vehicles work in a varied land, with hills and valleys, with holes, cliffs, mined land and with other obstacles they may run into their way (this obstacles are from the beginning in the studied land or they can appear instantly). The vehicles can depart all at the same moment or they can leave one at a moment. The vehicles can meet each other on their way but they must avoid the collisions by communicating with the server. The authors present efficient algorithms for the planning of some vehicles that have the mission to detect an obstacle.

Keywords: *intelligent vehicle, trajectory, algorithm*

EXPERIMENTAL RESEARCH ON REINFORCED POLYMER COMPOSITES WITH FIBERGLASS GAUZE

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Abstract: This work presents experimental research on obtaining and mechanical behavior of reinforced polymer composites with fiberglass gauze. There had been experimentally achieved structural layered composites of unsaturated polyester resins NESTRAPOL C96 and fiberglass gauze (reinforcing agent).

Keywords: *composites, polymer, glass fibers, resins*

AN INTELLIGENT SYSTEM SEARCH FOR INDOOR REFERENCE POINTS FOR LEGGED OR WHEELED SELF GUIDED SYSTEMS

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Abstract: Humanoids and Autonomous guided vehicles are coming to our lives. Autonomous guided vehicles are going beyond industrial environments. Effectively their use has been extended to domestic applications, such as cleaning robots or for assistance of disabled persons, but also in public buildings, such as museums, serving as guides for the visitors. The following paper describes a novel technique for image filtering, allowing to increment color uniformity in order to allow for color matching and identification.

Keywords: *artificial vision, retinex, image processing, robotics*