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PART I. CASTING

AA4032 ALLOY´S HEAT TRETMENT AND ITS INFLUENCE INTO SUBSTRUCTURE

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Aim of this work was to do divers heat treatment for AlSi12CuMgNi alloy as a temper hardening (artificial ageing) with different temperatures of purpose to acquire the best mechanical properties (breaking limit and creep limit in comparison with required dilatability min. 7 – 8 %). Further aims were to search exchanges in material substructure for several heat conditions, to compare this with reached mechanical values and with influence into form and character of receiving chip on the machining under the same conditions. From heat treatment view and strength properties influence for this Al_2Cu_3Ni alloy is some important intermetallic compound phase marked as the T phase, what makes precipitates stable in higher temperatures to the 300°C, too. Cu and Mg presence also makes intermetallic compound $CuMgAl_2$, what participates on the strength properties increase after heat treatment.

Key words: aluminum alloys, mechanical properties, treatment

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TESTING OF PLASMA AND HEAT SPRAYED LAYERS ON DIES AND FURTHER PARTS WITH LIQUID METAL AT PRESSURE DIE CASTING

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Plasma spraying molybdenum and ceramic layers and heat spraying molybdenum layers on samples are described in the contribution. Further theoretical analysis, evaluating adherence and microstructure of the layers together with results of technological tests of plasma sprayed samples on heat fatigue and tests of corrosion and application of tests results are mentioned.

Keywords: plasma spraying, heat spraying, molybdenum layer, ceramic layer, adherence of sprayed layers, tests on heat fatigue

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PART II. MACHINING

SURFACE ROUGHNESS DETERMINATION IN TURNING OF CYLINDRICAL SURFACES

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The topic of the article is the determination of theoretical values of surface roughness on cylindrical surfaces machined by turning. For the calculation of the values of main roughness parameters (R_{max}, R_z, R_a) a general mathematical model was developed, and a computer software based on this model has also developed. In the article this model and the software based on it gets introduced briefly, as the determination of connections between calculated theoretical values and measured data obtained through experiments.

Keywords: surface roughness, theoretical roughness.

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COMPARISON OF COATED CARBIDE CUTTING TOOL INSERTS USED IN MACHINING OF CYLINDER LINERS MADE OF GREY CAST IRON

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This article is aimed at the comparison of coated carbide cutting tool inserts used in machining of cylinder liners made of grey cast iron. The comparison has been realized through the tool life tests. The measurement has been carried out at three cutting speeds at constant cutting conditions. From the obtained values, the regression coefficients have been evaluated. Subsequently, extrapolation has been carried out by means of the regression line for the cutting speed in the range of 250 – 500 m/min, and for this the extended cutting speed range the interval reliability has been evaluated. In the experiments, it has been found, at the given conditions, it is not possible to recommend these cutting tool inserts for high speed machining.

Keywords: metal machining, carbides, coated cutting tool inserts, flank wear, tool life

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SURFACE FINISH IN TURNING OF NODULAR CAST IRON USING COATED CARBIDE AND SILICON NITRIDE CERAMIC TOOLS

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In this paper the surface finish produced by turning of perlitic-ferritic nodular cast iron (NCI) with multilayer (TiC/Ti(C,N)/Al_20_3/TiN) coated P20 carbide and nitride ceramic cutting tools is characterized using both 2D and 3D roughness parameters. The surface finish was characterized using a set of surface roughness parameters including vertical (Ra, Rz, Rt), horizontal (RSm), hybrid (RΔq), and additionally statistical (RSk, RKu) and functional parameters based on the bearing curve (Rmr(c) Rpk, Rvk, Rk). Some 3D roughness parameters were also considered and compared with 2D parameters. The data obtained can support the optimization of finishing operations of NCI parts.

Key words: nodular cast iron, surface finish, coated carbide tools, silicon nitride ceramic tools

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INFLUENCE OF GRINDING ON MACHINE PARTS WITH DESIGN NOTCHES

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The final shape of machine parts is formed out by means of machining. At the machining the surface rises of definite properties, a given integrity, from these a surface usage comes out in the final machinery. This surface use is put especially its service life and loading capacity. The manufacturing watches the selected elements of the surface integrity for the functionality assurance of the machine parts. The machining influences in a different way the variant components. These are e.g. construction notches – the changeovers of single design components. The selection of a technology method of machining, the cutting tool at the finishing can affect notably both the function and service life of a machine part. The paper deals with the surface integrity at the surface load in machinery. There are the questions of the construction notches and next elements owing to the use of finishing method.

Key words: grinding, loading, machine part, integrity, notch

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MULTI AXES GRINDING OF SCULPTURED SURFACES

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This paper presents the use of the CAD/CAM system Cimatron for free programming of NC grinding machines. NC technology use, first of all in milling, turning and drilling operations, is widely dispersed at present. Development of these technologies depends to some extent on the cutting tools which are to be produced and sharpened to a high quality. Usable properties of the cutting tools, e.g. the shape accuracy, the quality of function surfaces, etc., are inspired by the production technology used. This technology plays a main role in production and sharpening of powerful and complex shaped cutting tools.

Key words: Kinematics of grinding, sculptured surfaces, CAD/CAM system Cimatron, NC module, NC program

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COMPARISON OF CUTTING TOOL INSERT´S MADE OF OXIDE CUTTING CERAMIC MACHINING OF GREY CAST IRON

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In this article there you can find comparisons of several types of cutting tool insert´s of oxide cutting ceramics machining of grey cast iron. Experiments had to serve the realization of long-term durability tests. Very important angle for balance was the index of Taylor´s equation that represents the influence of cutting speed on the durability and power optimization. By experimenting, there were discovered precious features of some kinds of compared cutting tool insert´s and their references to the power optimization for machining grey cast iron.

Keywords: machining of metal, cutting ceramics, durability, tool wear

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INVESTIGATIONS OF BROACH WEDGES WEAR

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One of the most important problems in broaching technology is wedge wear one. The main trouble is to establish proper criterion of admissible wedge wear. Theoretical analysis of the loading of cutting wedge during broaching has been presented. Subsequent phases of broach wedges wear have been shown, on the base of authors' own investigations. The research has brought the authors to the conclusion that broach wear should be determined by other indicator thanks to which the state of the process can be easily and quickly defined. Such an indication is the condition of the surface layer being machined.

Key words: broach, broaching, wedge wear

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HIGH-SPEED GRINDING PROCESS RESULTS

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This paper deals with investigation of physical and mechanical characteristics of grinding materials and evaluation shaping of these properties in abrasive tools. Experimental results of high power grinding are introduced. State of stress enumeration of rotating wheels and critical velocity of shaped grinding wheels are shown.

Key words: Grinding, High-Speed, Simulation, Grinding Grain

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Design for Machining

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Concurrent engineering plays an important role in manufacturing. Cooperation among all factors relating to the realisation of products is now necessary. Production costs represent about 40% of the selling price of products and therefore design for production and for other aspects is very important

Keywords: concurrent engineering, production, machining, design, costs

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COMPARISON OF DRILL CUTTING EFFICIENCY FROM DIFFERENT TOOL MATERIALS

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Development of cutting tools is basic condition for rationalization of process cutting because it goes out from need of processing new constructional materials. From view of tool it takes application progressive cutting materials. Cutting tools so relevantly make for accomplishment main demand on methods of cutting; it is provision of high productivity production and attainment of desideration of finish surface. It is known, that cutting property of cutting tool is influence by many factors.

Keywords: Drilling, Tool Materials, High-speed Steel, Wear of Tool

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HIGH-PRODUCTION LATHE-TURNING WITH Ra ≤ 1μm

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At classical machining with a tool having defined tip radius, the shape of tip is copied onto the machined surface of workpiece. Among the highest height of profile unevenness *Rz*, shift *f* and tip radius, the analitical relation is valid, by which increasing of *f* strongly increases *Rz*. This is the main obstacle in increasing machining productivity. The solution is in increasing the tip radius of tool. Within enourmous increase of *rε* even by roughing, the medium arithmetic height of unevenness of machined profile *Ra* less than 1μm can be obtained. This contribution analyses this option.

Keywords: machining, workpiece, surface roughness, tool

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PART III. MACHINES AND AUTOMATION

THE ROBUST SERVO OF THE ELECTRIC INDUSTRIAL ROBOT I.

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This paper deals with the problems of acceleration loop speed servos with a subordinate acceleration controller. The acceleration signal is generated by the analog speed sensor (using the averager and differentiator). By using an acceleration loop in speed control circuit we are able to achieve better qualities of such circuit. This solution has properties of a robust system. The solution is suitable to meet the requirements of a wide range of rpm regulation, run uniformity as well as the devices featuring either non-stationary or extremely high load of inertia moment. This paper also deals with the results of application of acceleration loop in the speed servosystem of electrical servomotor HSM 60. Experimental results correspond to previous theoretical assumptions.

Key words: speed servo, robust servo, parametric invariant system, speed control, industrial robot

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THE ROBUST SERVO OF THE ELECTRIC INDUSTRIAL ROBOT II.

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This paper deals with the problems of acceleration loop speed servos with a subordinate acceleration controller. The acceleration signal is generated by the analog speed sensor. By using an acceleration loop in speed (and position) control circuit we are able to achieve better qualities of such circuit. This solution has the properties of a robust system. The solution is suitable to meet the requirements of a wide range of rpm regulation, run uniformity as well as the devices featuring either non-stationary or extremely high load inertia moment. This paper deals also with the results of application of acceleration loop in the servosystem of industrial robot APR – 20. Experimental results correspond to previous theoretical assumptions.

Key words: speed servo, robust servo, parametric invariant system, speed control, industrial robot

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COMPARISON OF PARAMETER VARIATION SENSITIVITY USING TWO CONTROL METHODOLOGIES FOR HSM60 SERVOMOTOR

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The control of DC servomotors used in robotics is usually carried out using conventional PI controllers that might serve their purpose well in case of absence of any parameter variation. Nevertheless, this is rarely case in practice as with any change in load the inertia moment is naturally changed resulting in much worse performance of a PI controller. The main topic of this paper is the comparison of two possible control methodologies for decreasing the parameter variation sensitivity of the whole control system : acceleration loop and fuzzy controller. It is shown that even a basic fuzzy controller with rather small number of fuzzy rules (computationally undemanding) performs very well even under conditions of extreme inertia moment variation and is capable of outperforming a conventional method of using acceleration loop.

Keywords: fuzzy controller, acceleration loop, inertia moment, oscillatory response

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PART IV. PRODUCTION MANAGEMENT

INFRASTRUCTURE HOW SUPPORT OF MANUFACTURING TECHNOLOGY IN THE CONTEXT OF MANAGEMENT SYSTEMS REQUIREMENTS

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Introduction into problems - The quality of the product, generally perceived as a measure of requirement completion, is determined by many factors. One of the main factors is the level of infrastructure. Many of the established management systems which are consistent with accepted standards involve provision and infrastructure maintenance as a requirement of these standards. Machinery and equipment maintenance neccessary for conformity achievement is pursued as one of the processes through management systems of quality, environment and occupation health and safety.

Key words: Machine, equipment, infrastructure, maintenance, management systems.

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