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Fig.1. Three types of contact under
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PRODUCTION REQUIRES AN APPRECIATION OF THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE MATERIAL FOR MACHINING

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ABSTRACT

Quality and characteristics of a material are important factor for successful manufacturing. Quality control of the material at the beginning of a production process is usually based on mechanical characteristics control and rarely on identification of structure and chemical composition. Measurement of tribological characteristics of materials (anti-frictional and anti-wear) and their abrasive resistance is still not performed in our country. This paper presents the results of tribological properties assesment of specific group of materials [2].
Scrack test consists in the application of a special device that allows increasing the load force by changing the sample carrier at a constant speed. In doing so, a diagrammatic dependence of the load forces-friction forces is formed. Tribometarblock on study was sucesfuly done. Electrical discharge machining (EDM) is a material removal procedure which can be used to machine all electro conductive materials regardless on their physical-metalurgical properties. But not all electro conductive materials are machined equally efficiently so each of them has its own characteristic EDM machinability. As an indicator can be taken different criteria such as: erosion speed, quality of machined surface, wear of electrode-part, specific energy consumption etc.
Keywords: *Residual stresses, quenching, Sach boring technique, resistance*

MATERIALS ABRASIVE RESISTANCE MEASUREMENT

resence of abrasive mechanism in industry and transport can be found in almost 60% of tribomechanical systems. Contact surfaces of many machine and devices parts are coated with various types of coatings so the overall abrasive resistance of critical part of tribomechanical system is increased. Measurement of coatings and other material abrasive resistance is performed on measuring gmethodology is based on forming of scratches on contact surface of element which resistance is about to be measured [5]. On Fig. 5 Domestic Scratch tester ST-99 is shown together with the principle of measurement.

Fig.5. Scratch tester ST-99 with appurtenant instrumentation

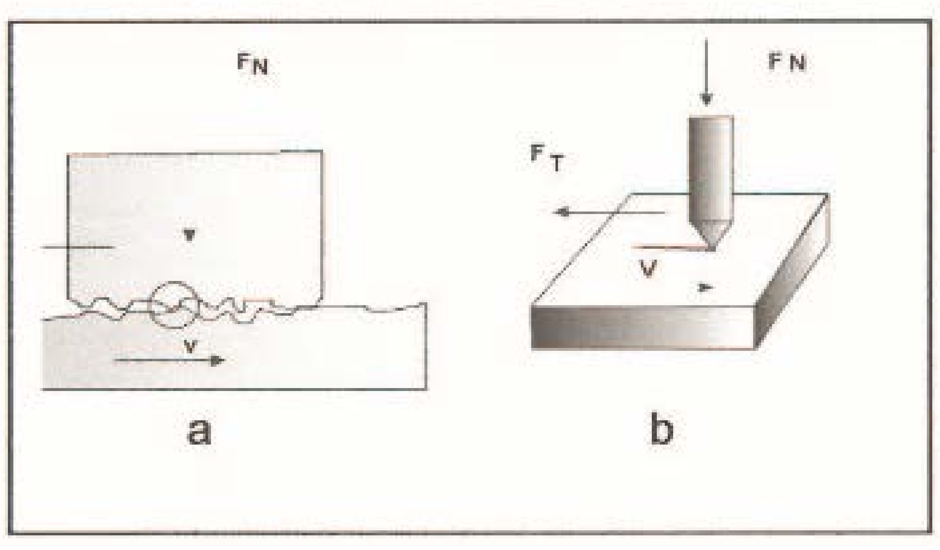

Fig.6. Simulation of the movement of the peak of unevennes of one body after another

Fig.7. The first and the last abrasive wear trace

CONCLUSION

Analyzing the status of production technologies application in contemporary manufacturing, conclusion can be made that widest area of industrial application belongs to the technology of material removal. This specific technology covers conventional and nonconventional material forming by material removal. Conventional processesmaterial removal are based on chip forming with hard tool of specific geometric shape. Nonconventional machining is performed by material removal with various physical-chemical mechanisms.
The presence of Scratch testers in research laboratories enables the development of contact zone, solids research and many friction and wear issues

MEASUREMENT OF ANTIFRICTION CHARACTERISTICS OF MATERIALS

Determination of antifriction properties of material is performed by measuring friction forces in the contact zone with another material during presence of lubricant as the third element in contact. As it is known friction force is the resistance of one solid body movement on another with presence of a normal load [3].
Antifriction characteristics of material depends on conditions under which that contact is achieved (sliding, rolling, impact…) and contact geometry (contact in point, line or surface). This means that friction force as an anti-friction characteristic of a material can have different values. Because of this, antifriction characteristic is considered to be relative value.
Measurement of friction and determination of friction coefficient is performed on tribometers which have the possibility to achieve all three types of contact under different conditions meaning sliding speed and load, Figure 1.

A pin is made of high-speed steel of average hardness was used in all experiments
Lubrication was performed by passing the lower part of the disk through an oil bath in which there was always the same amount of UBA 5 oil. In this way, boundary lubrication was achieved in the contact zone of the pin and the disk. S
amount of oil UBA 5. In this way, the limit lubrication in the contact zone of the pin and the disk is achieved. With the change of the disc, the oil was also changed. The oil with the wear products was placed in special vessels with the test mark.
The duration of contact in all in all experiments was the same and was 120 minutes and the friction force Fn = 315 N.
Determination of disc wear after contact was performed by measuring PQ index on PQ 2000 Particle Qua Figure 4 PQ Particle quantifier with oil samples.
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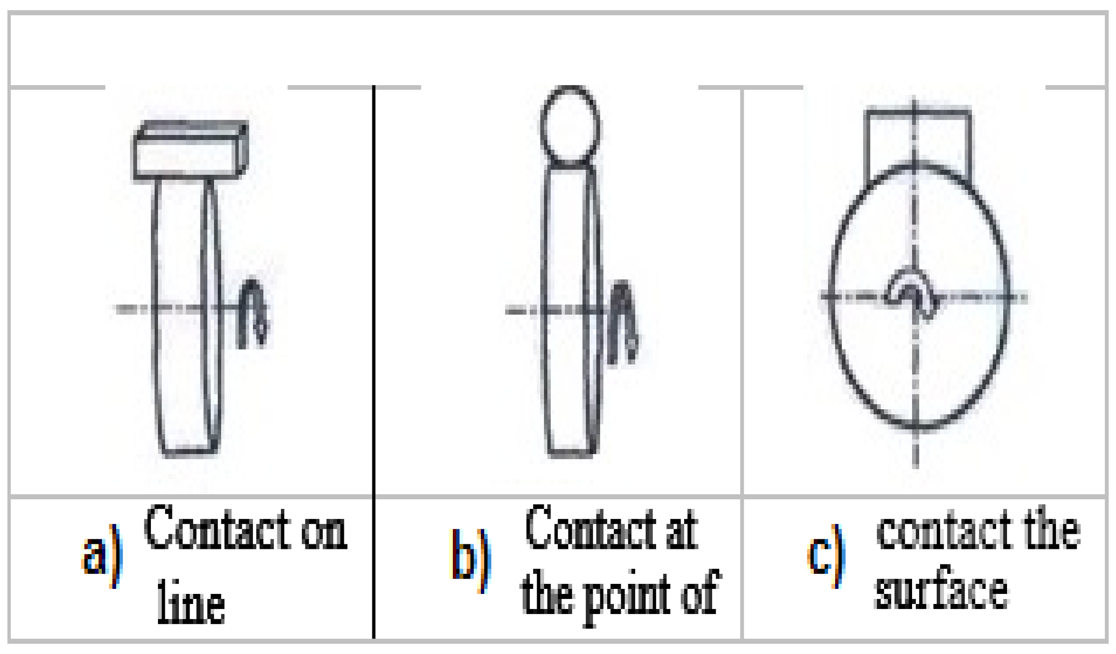

Fig.1. Three types of contact under different conditions, Example of tribometer from family ″Block on Disk″ is shown on Fig. 2.

Measuring instruments of mentioned type (tribometers) are connected with personal computer. Through this is, with help of adequate software, monitored friction process and measured friction force, auxiliary load and coefficient of friction.
On Fig. 3 and Fig. 4 are shown examples of measurement results performed on Tribometer TPD 2000 during program of defining tribological characteristics of a group of nodular cast iron in contact with grey cast NL 600 and steel Č1530.

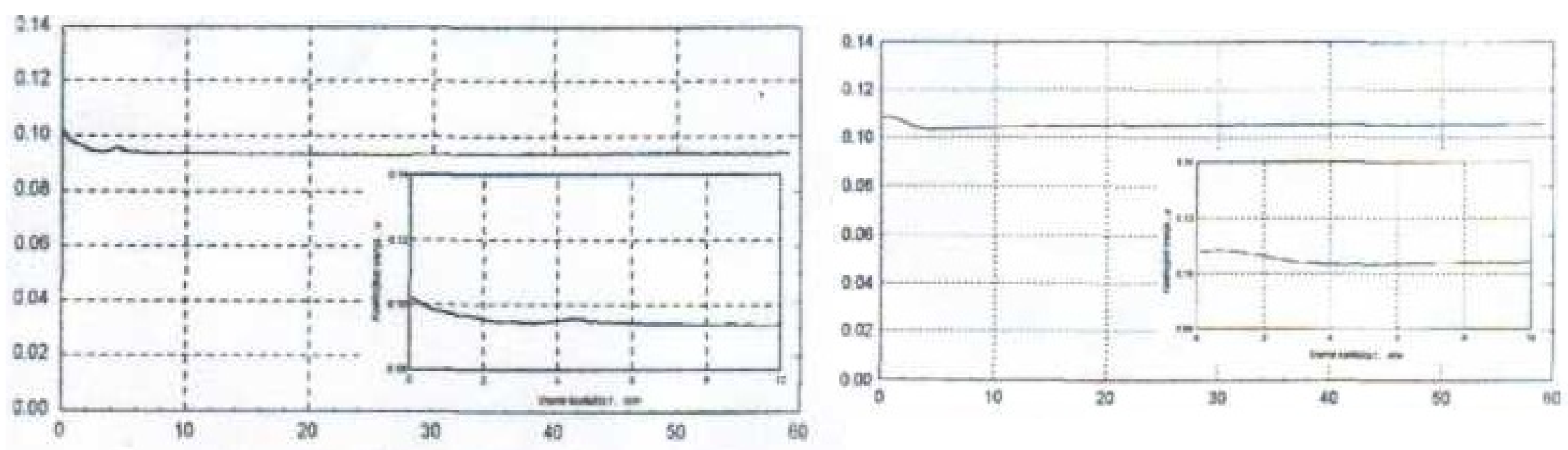

Fig.3. Experimental dependence μ-f_1(t) Contact: NL600/Č1530

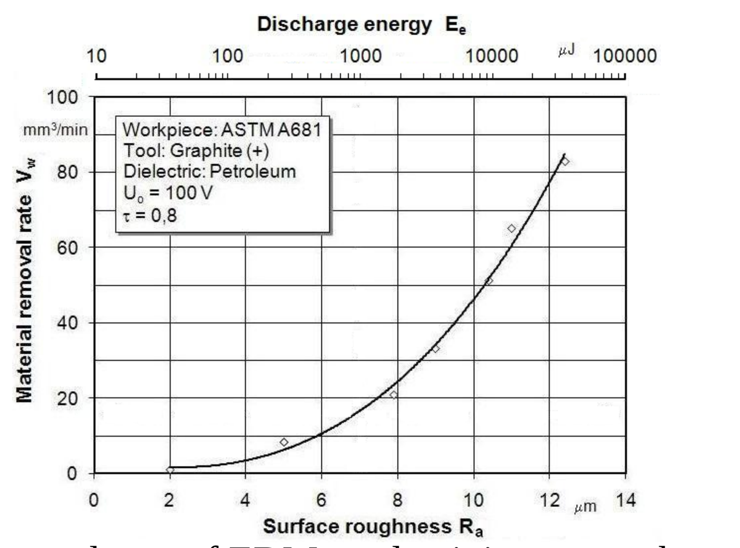

Fig.8. Dependency of EDM productivity on roughness of machined surface in function of impulse energy

Material Machinability by Electroerosion

Electrical discharge machining (EDM) is a material removal procedure which can be used to machine all electro conductive materials regardless on their physical-metallurgical properties. But not all electro conductive materials are machined equally efficiently so each of them has its own characteristic EDM machinability. As an indicator can be taken different criteria such as: erosion speed, quality of machined surface, wear of electrode-part, specific energy consumption etc.
Material removal in EDM is performed by periodic transformation of electric energy into heat, during which a local meltdown is caused and evaporation of material as a consequence. Basic parameters which define process of material removal are electric impulse parameters resp. energy of impulse.
Research regarding machinability by EDM in industrial conditions, depending on electric impulse parameters, are performed by Gostimirovic et al. [6, 7]. On fig. 8 is shown a systematic dependency of basic technological parameters from impulse energy, as a groundwork for selection of optimal parameters electrical impulse in EDM.
With installation of EDM machine in Laboratory for machining processes by chip removal on Faculty of Technical Sciences in Novi Sad – Serbia, conditions are met for detail laboratory investigation of machinability by EDM. Specific machine is a CNC die sink electrical discharge machine, type Agie Charmilles SP 1U fig. 8 Technical specifications of the EDM machine: axis travel X/Y/Z 320x250x250 mm, max. workpiece dimensions 790x480x235 mm, electrode weight 60 kg, machining current 50 A, max. removal rate 330 mm3/min and best surface finish 0,3 μm.
Investigation of machinability will be performed based on availability of copper/graphite-steel technologies and copper/copper tungsten-carbide but also for specific types of part material and tools with defined characteristic and quality.

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