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IONIZATION OF CUTTING FLUIDS

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Abstract: *The paper analyzes the effect of ionized air on cutting tools at cutting processes of structural and high-alloyed steels. It defines a field assuming exploitation and actual stage in section of evaluation performance measurements.*
Key words: *Cutting fluid, cutting process, ecology, ozone*

1. INTRODUCTION

There is still more and more pressure for finding the new ecological possibilities of industrial technologies and this is why is necessary to think about improving of the basic processes of production. *The new materials increase the demands of tools, cutting machines and also the demands of new technologies of cutting process*. The refrigerate technology using the ionization air really fulfils a condition of finding the ecological way of chippy cutting for industrial output. This way of refrigerates and chemical influence of the cutting process based on principle changes the process medium and on removing cutting liquids and biological defects connected with its liquidation is used in specific determine areas of application. It is emphasized the specification of using this new method, because cutting liquid has still its very important place in manufacture practice.

Increasing utilization of these new ecologically methods of technology can considerably change presently the opinions in the area of development of new cutting tools and machine tools. Introduction of shaping without using cutting liquids will require a great effort in next years just because of delimitation utilizing areas for application such methods.

2. APLIKACION AREA

2.1 Contemporary opportunities for ecology of chippy cutting

The productive technological reality of horizon represents certain ecological directions. We can concrete individual spheres of application research for shaping in horizon of these ideas. The demands are increasing and lawful terms for ecological production are ordered, that is included in regulations. This method guarantees safety and protection of environment in conditions of machine-industries at the same time. Ecologically acceptable shaping confirms efforts for development activities, which compensate negative impact of industrial activities to environment. The areas in which these activities become evident could determine and extend on.

It refers to [2]:

- Recycling and regeneration process of convectional cutting liquids
- Cutting process using accessory of ecologically cutting liquids
- Cutting process using minimum deal of cutting fluids
- Cutting process using help of refrigerate cold air
- Cutting process without using cutting fluids so-called dry cutting process

- Cutting process with usage of ionization air

The main task of production technology is to ensure production quality and minimum costs. Nowadays the aspects of environmental protection are preferred and emphasized.

2.2 The influence of ionization fluids to durability of cutting tools

The development of production technology has a considerable influence to progressivity of cutting conditions in cutting process. The cutting speeds have increasing character so they change conditions of application of cutting fluids. Cutting intensity that is influenced this way is characterized by durability period of concrete cutting edge or cutting tool.

We come to confrontation of each effects of using cutting fluids after deep analysis of the influence of cutting speed referring to proper cutting fluids. We realize that except the refrigerating effect, the effect to state of frictional intensity amount are assigned to them and to measured value of cutting intensity and quality of cutting surface in final consequence.

Air ionized with the ozone as its interesting element, highly active oxidative effect is distinguished and is multiplied by the temperature state in cutting area during cutting process. The basic source of effects for cutting process are the elements of chemical substances that are getting to cutting zone in relatively sufficient overrun

The tests of durability of cutting tools made of various materials in process of cutting steel 12 050 have been transported and free-cutting brass CuZn37 with various cutting fluids in laboratory conditions of our department.

The realized measurements of durability relation of cutting edge to machine time in certain cases of material types of cutting tools /high-speed cutting iron, cemented carbide/ prove apparent contribution in the area of increasing durability period of cutting tool at precise definite cutting conditions.

This favorable influence was not measurable and marked with usage of the tool made of ceramics cutting materials.

The whole projected technologic scheme is based on designed and manufactured outfit for continuous ionization of air, working under low compression. The operating regulation of the scheme for individual or grouped applying for industrial practice will work after determination and value measurement of the concentration of individual elements of the cutting fluids.

3. EXPERIMENTAL RESULTS

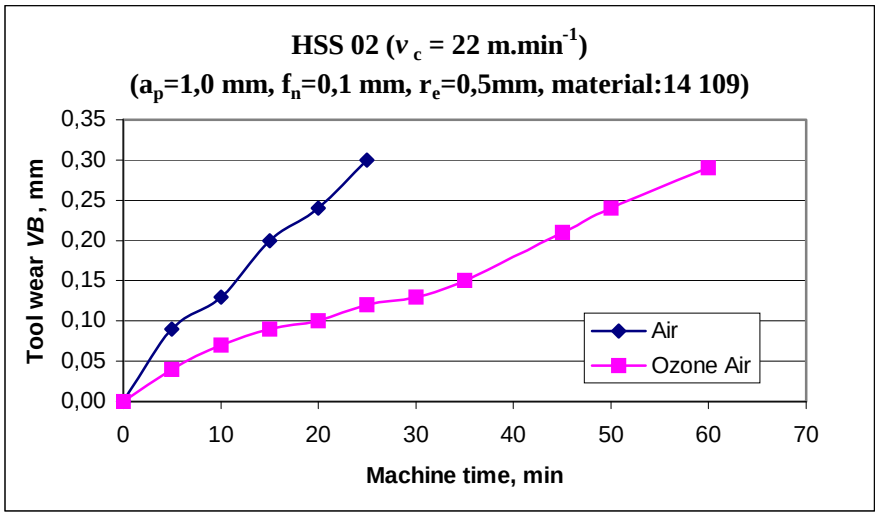

Fig.1: The course of functional of dependence of durability *VB* and machine time τ_s

Gaseous medium has its great influence to durability. Our experimental measurements of wearing of a cutting tool prove occurrence of influence of ionization air as a cutting fluid at the application for cutting iron with usage of tools made of high-speed cutting high-alloyed steel. For our measurements was used tool: turning through right-cut tool 20 x 20.

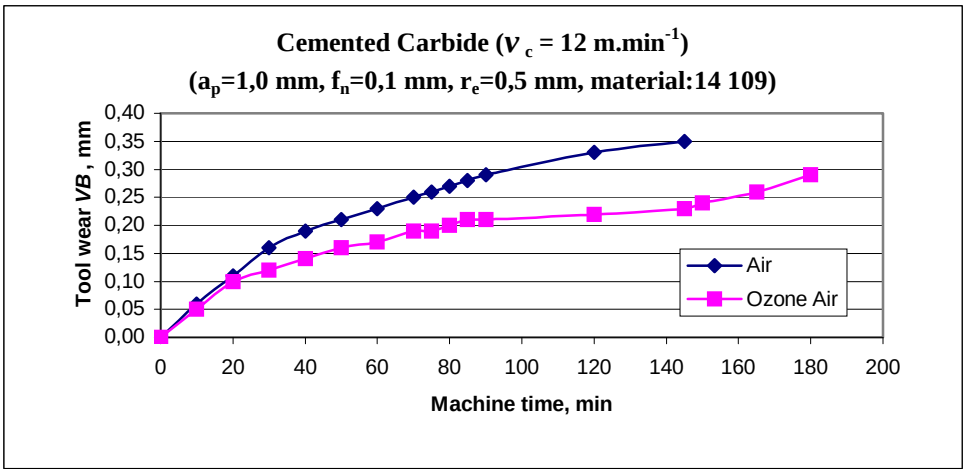

Fig.2: The course of functional of dependence of durability *VB* and machine time τ_s

The time of durability of the main back of tool in comparison of cutting material 14 109,3 in two cases:

1. Without usage of refrigerating flow of ionized air
2. With usage of refrigerating flow of ionized air

The results of experimental measurements indicates possibility of effective use the classical cutting tools made of high-speed cutting iron and favorable results indicates, too at applying non coating tools of cemented carbides. Non effective method was indicated at the application of ceramic cutting tools.

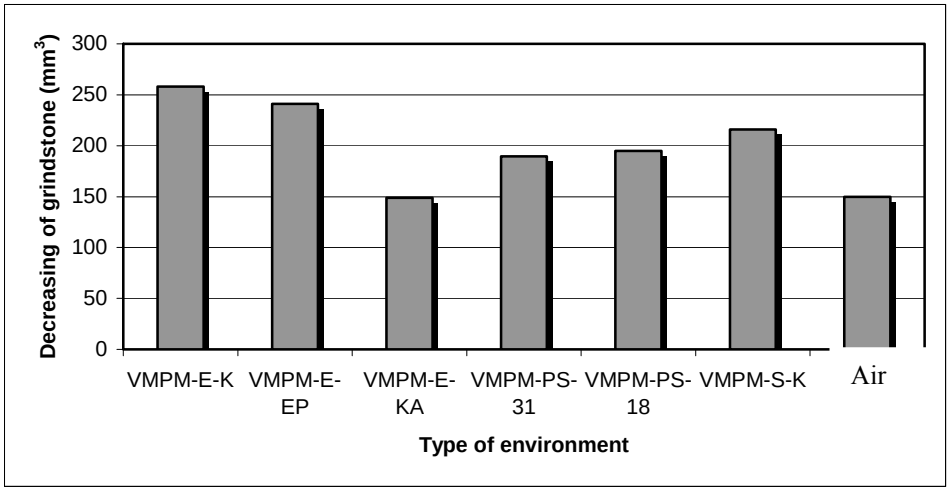

Fig.3: The result of experimental measurement of grindstone fall [7]

Certain efficient effect of refrigerating exist in opportunity of application the grind working [5] when the production costs could decrease about 10% to 15%.Possible alternate is

use of pressed air without ionization. But according attained results at the experimental measurements of turning with use of ionization air flow, could be predicted favorable influence to the tooling just rising of oxides in the superficial microlaminated tooling surface.

4. CONCLUSION

Between new conceptions which increases the production of tooling/=working/ with respect to improving of working environment belongs industrial technologies based on dry principle. Between these technologies belongs the chippy cutting technology with use of ionization air flow. Experimental measurements in laboratory conditions of the Department of manufacturing technologies have not been finished yet. There is to be supposed positive chemical effects especially at the inclination to production of scabs at the chippy tooling.

Reviewer:
Prof. Ing. Karol Vasilko, DrSc.

5. LITERATURE

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