INVESTIGATION OF WORK CONDITIONS INFLUENCE ON WHITE LAYER FORMATION IN HARD MACHINING OF RUL1V BEARING STEEL

STANIMIR Alexandru, PASCU Ileana-Cristina, BENGA Gabriel[2]
[1]University of Craiova
alexstanimir@yahoo.com, i_pascu@yahoo.com, gabrielbenga@yahoo.com

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Abstract: In this paper, the microstructure and micro hardness modification produced in surfaces of hardened parts machined in different work conditions was experimentally investigated. In order to find the appropriate cutting parameters that reduce the apparition of white layer in the machined surface, orthogonal cutting tests of hardened RUL 1V steel (61 HRC), were carried out at various values of rake angle, flank wear, undeformed chip thickness and cutting speed. The results show that, depending on work conditions considered in this experiment, the white layer thickness ranges between 1 and 40 μm and the measurement of microhardness from surface to the base material show that, generally, there are not significant variations. Furthermore, the experimental conditions that give minimum white layer thickness is discussed with respect to the cutting conditions used in finish machining.

Microstructure in surface layer and microhardness variation with the distance from surface (fig. 1 and 2).

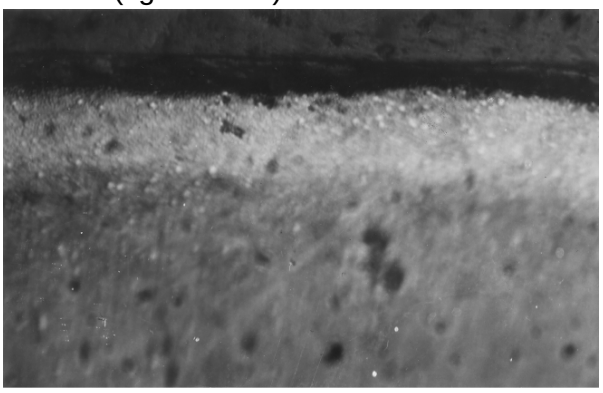

Fig. 1. Surface layer microstructure X500, Rul 1 V steel 720 HV, cutting conditions a_1=0,1mm, b_1=0,5mm, Vc=125m/min, γ=-50°, no coolant

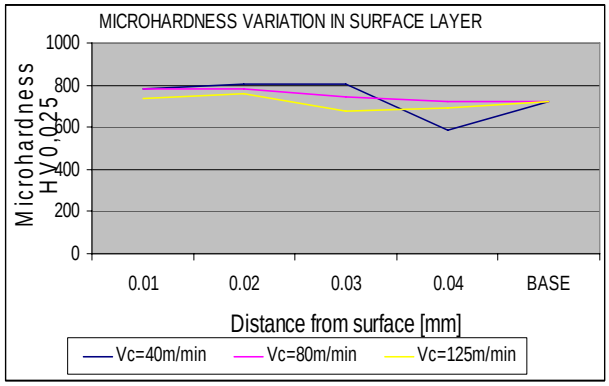

Fig. 2. Surface layer microhardness variation for different cutting speeds in machining of Rul 1 V steel 720 HV, cutting conditions a_1=0,1mm, b_1=0,5mm, γ=-50°, no coolant

For the considered tests conditions it was concluded:

- the structural modifications in the surface layer depends in any case by the thickness variations of the undetached chip a_1 and by the Vc cutting speed;
- the rake angle, with higher negative values, has the most important influence on surface layer formation;
- the microhardness variation in the superficial layer is small, this can have closer values with the ones of the base material.

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