

Investigation of cutting tool influences on white layer formation for a turning process of hardened 16MnCr5 steel

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Abstract

Investigation of conditions for white layer formation as well as its characteristics (geometrical, mechanical, physical etc.) during a cutting process of hardened materials, requires cutting tool, among others, to be taken into account as one from the set of influencing factors. Generally speaking, influence of the cutting tool on the above mentioned object of research activities (white layer formation and its characteristics) could be observed from the following aspects:

- cutting tool geometry,
- cutting tool material and manufacturing technologies, and
- physical-mechanical-thermal cutting tool characteristics.

In this research, from the set of influencing cutting tool factors, cutting tool corner radius and cutting tool material were observed with analysis of type and scale of their influence on white layer formation for the turning operation of hardened 16MnCr5 steel. Cutting tool corner radius was observed for three levels (0.4, 0.8 and 1.2 mm), while regarding cutting tool material two mostly used materials in this field were observed, black ceramic (Al₂O₃-TiCN) and cubic boron nitride (CBN). Analysis of experimental results showed inverse proportion between cutting tool corner radius and average thickness of the white layer, as well as significance of indirect influence of cutting tool material on white layer formation and its characteristics, via the tool wear shape.