

Active Part of the Burnishing Tool Effect on the Physico-Geometric Aspect of the Superficial Layer of 100C6 and 16NC6 Steels

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Abstract : Burnishing is a mechanical surface treatment that combines several beneficial effects on the two steel grades studied. The application of burnishing to the ball or to the tip favors a better roughness compared to turning. In addition, it allows the consolidation of the surface layers through work hardening phenomena. The optimal effects are closely related to the treatment parameters and the active part of the device. With an improvement of 78% on the roughness, burnishing can be defined as a finishing operation in the machining range. With a 44% gain in consolidation rate, this treatment is an effective process for material consolidation. These effects are affected by several factors. The factors V, f, P, r, and i have the most significant effects on both roughness and hardness. Ball or tip burnishing leads to the consolidation of the surface layers of both grades 100C6 and 16NC6 steels by work hardening. For each steel grade and its mechanical treatment, the rational tensile curve has been drawn. Lüdwick's law is used to better plot the work hardening curve. For both grades, a material hardening law is established. For 100C6 steel, these results show a work hardening coefficient and a consolidation rate of 0.513 and 44, respectively, compared to the surface layers processed by turning. When 16NC6 steel is processed, the work hardening coefficient is about 0.29. Hardness tests characterize well the burnished depth. The layer affected by work hardening can reach up to 0.4 mm. Simulation of the tests is of great importance to provide the details at the local scale of the material. Conventional tensile curves provide a satisfactory indication of the toughness of 100C6 and 16NC6 materials. A simulation of the tensile curves revealed good agreement between the experimental and simulation results for both steels.

Keywords : 100C6 steel, 16NC6 steel, burnishing, work hardening, roughness, hardness

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