

Manufacturing of Femoral Heads from Ti-6Al-4V Alloy with High Speed Machining: 3D Finite Element Modelling and Experimental Validation

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Titanium alloys are used for the manufacturing of femoral heads for orthopaedic implants. Poor machinability of these materials, especially at high speeds, creates the need for more detailed investigations on this subject. The at hand study analyzes the construction of 3D Finite Element Method (FEM) models pertaining to the manufacturing of femoral heads made from Ti-6Al-4V. For this purpose a commercial FEM programme is employed, specialising in machining modelling, namely AdvantEdge. The validation of the model is provided through experiments on actual femoral heads cut in a CNC lathe at high cutting speeds. Comparison between experimental and numerical results on cutting forces and chip morphology exhibits a good agreement, indicating the success of the proposed models. These 3D models can be used for realistically estimating the influence of cutting conditions on the final product, without performing time and money consuming experiments.

Keywords: Femoral Heads, High Speed Machining, Titanium alloys, FEM Modelling, Chip Morphology

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