Cutting Force Modelling with a Combined Influence of Tool Wear and Tool Geometry

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Modelling of cutting forces is important for understanding and simulation of the machining processes. This paper presents cutting force modelling of data obtained from machining of C45 carbon steel with a coated carbide tool. The model is based on a rather extensive measurement of 270 combinations of cutting tool geometry parameters (rake angle, clearance angle and helix angle), tool wear (flank wear average value), chip thickness and cutting velocity. The model with the friction and cutting component of the cutting force is presented and discussed. We conducted an analysis of the identified model and found a relationship between the increase in tangential and radial cutting forces and tool wear. We concluded that flank wear influences the cutting force acting on the worn tool more significantly than cutting tool geometry. This is caused by changes in cutting edge geometry and the resultant significant increase in the friction component of the cutting force as is shown using the identified model.

Keywords: Cutting Forces, Cutting Force Modelling, Flank Wear, Milling

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