

Modeling energy utilization during machining operations

G. Pienkowski¹, J. Krzyzanowski¹, J. Maczka¹,

¹Wroclaw University of Technology, Mechanical Department, Wybrzeze Wyspianskiego 27, 50-370,
Wroclaw

grzegorz.pienkowski@pwr.wroc.pl

Abstract

The purpose of conducted research is to create a method that would allow to simulate energy consumption during machining a product, already in a stage of product design and production planning in CAD/CAM system. This will allow a product redesign or a change of configuration of machining operations to obtain less energy consuming manufacturing process. Energy consumption during machining is connected with power consumption by machine tool engines. The first one is the energy of machining resulting from effective power consumption (P_c). The rest of utilized energy is connected with the power consumption by a machine tool during idle run (P_i) and machining (P_w), for losses in motors, used to overcome the resistance in kinematical chains, etc. Therefore a method for obtaining a complete power consumption characteristic of a machine tool with multiple engines (e.g. main drive, feed drive, tool exchange drive, etc.) is described on an example of a lathe. The method will allow to establish a level of whole energy utilization on the basis of technological parameters (feed, cutting speed, etc.). An algorithm for combination of energy utilization during machining with feature based product design and technological process planning in CAD/CAM systems is presented.