

ABSTRACT

2D Ultrasonic vibration assisted turning (2D UVAT) is a technology applied to the lathe process by adding ultrasonic vibrations to the Tool Holder resulting in an elliptical motion at the end of the insert during the crash process which reduces the cracking of the metal surface of the work piece so that the cutting results are smoother. The design of the Tool Holder becomes a crucial part that enhances the performance of the vibrations given because the vibrations generated from the 2D UVAT process are transmitted directly through the Tool Holder on the material removal process that takes place. With the main parameters affecting the result of 2D UVAT lathing is spindle speed, depth of cut, feed rate, and frequency. Along with the good results, the application of 2D UVAT technology also requires several additional devices for setting and measuring the results generated in the research, so that in obtaining the design Tool Holder that is able to deliver good vibration requires great cost and time. The finite element method is the most widely used numerical technique method in the modeling process. The basic principle of the finite element method is to perform the replacement of a continuum by the finite elements that make up the mesh. Each geometry is simplified in the finite element to facilitate the analysis of the actual structure. The purpose of this study is to determine the ultrasonic vibration assisted turning Tool Holder design that produces the smallest stress value by minimizing the time and cost in the selection process. By doing this study it is found that by using the simulation process it can be found that the design of Tool Holder with 3 Hinges become the chosen design which is able to generate the lowest stress value among 2 other designs and by using simulation process can optimize the cost of the testing process with value Rp 373,144,527 for the procurement of simulation devices and Rp 12,401,156.34 for rentals compared to the experimental process with total cost requirements and oprational for procurement worth Rp 602,743,392.88 and for rentals amounting to Rp 68,962,905.10 but not with time because the simulation in this study takes longer time with time 843 hours compared with an experiment that only takes 188 hours..

Keywords: Finite Element Method, 2D UVAT, process removal material, tool holder, spindle speed, depth of cut, feed rate, and frequency