World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:14, No:08, 2020

Comparison between the Performances of Different Boring Bars in the Internal Turning of Long Overhangs

Authors : Wallyson Thomas, Zsombor Fulop, Attila Szilagyi

Abstract : Impact dampers are mainly used in the metal-mechanical industry in operations that generate too much vibration in the machining system. Internal turning processes become unstable during the machining of deep holes, in which the tool holder is used with long overhangs (high length-to-diameter ratios). The devices coupled with active dampers, are expensive and require the use of advanced electronics. On the other hand, passive impact dampers (PID – Particle Impact Dampers) are cheaper alternatives that are easier to adapt to the machine's fixation system, once that, in this last case, a cavity filled with particles is simply added to the structure of the tool holder. The cavity dimensions and the diameter of the spheres are pre-determined. Thus, when passive dampers are employed during the machining process, the vibration is transferred from the tip of the tool to the structure of the boring bar, where it is absorbed by the fixation system. This work proposes to compare the behaviors of a conventional solid boring bar and a boring bar with a passive impact damper in turning while using the highest possible L/D (length-to-diameter ratio) of the tool and an Easy Fix fixation system (also called: Split Bushing Holding System). It is also intended to optimize the impact absorption parameters, as the filling percentage of the cavity and the diameter of the spheres. The test specimens were made of hardened material and machined in a Computer Numerical Control (CNC) lathe. The laboratory tests showed that when the cavity of the boring bar is totally filled with minimally spaced spheres of the largest diameter, the gain in absorption allowed of obtaining, with an L/D equal to 6, the same surface roughness obtained when using the solid boring bar with an L/D equal to 3.4. The use of the passive particle impact damper resulted in, therefore, increased static stiffness and reduced deflexion of the tool.

Keywords : active damper, fixation system, hardened material, passive damper
Conference Title : ICAMAME 2020 : International Conference on Aerospace, Mechanical, Automotive and Materials Engineering
Conference Location : Budapest, Hungary
Conference Dates : August 19-20, 2020