Identifiant de la contribution : **239** Type : **non spécifié**

”PACO#1 - Vibration response of a machine structure filled with high-damping material”

mercredi 12 juillet 2023 14:00 (20)

This work focuses on the use of a polymer concrete as a filling material of structural parts to damp vibrations in machine tools. The goal of the overall project is to improve the dynamic behavior of CNC lathe systems by limiting at most the vibrations triggered in operative conditions, in order to guarantee a high productivity of the machine tool while keeping the machining quality of the final products. The task is very challenging since the vibrations transmitted to the tool-workpiece area through the structures of both the lathe and its joined bar-feeder are mainly associated with the bars’ critical velocities, which are extremely variable in a wide range. Indeed, the latter depend on operative factors that are not constant for all the working conditions of the system, e.g. material and geometry of the bar to be machined, working angular speed, instantaneous free-length of the bar supported by the bar-feeder... As a consequence, designing the machine structures in order to avoid resonances in the large broadband of the excitations is basically impossible. Hence, a successful strategy could be levering the structural components’ damping in order to limit the vibration levels in a wide frequency band. To this purpose, polymer concretes, mineral casts, and metal foams can be used as filler of machine tools and automatic machines beds. The prototype of a new base €“ filled with a commercial polymer concrete €“ of an automatic bar-feeder was developed and many laboratory tests were performed. Vibration signals were acquired for different working conditions (varying both the bars and the spindle velocity of the connected lathe). The comparison of the dynamic responses of the original machine (no filler) and the new variant highlights an overall favorable effect of the high-damping material properties, though a slight worsening appeared in a few circumstances (likely due to the additional mass of the filler that lowers natural frequencies thus making the vibration amplitudes increase). This work illustrates the design of the new prototype, the performed experiments, the results of the signal analyses, and some concluding remarks on possible future developments for the presented application.

Presenter(s) : MARTINI ALBERTO

Classification par session : Survishino 11 / Passive control of Vibrations