

54<sup>th</sup> CIRP Conference on Manufacturing Systems

## Additively manufactured, particle-filled damping structures with magnetorheological fluids

Kim Torben Werkle\*, Christian Menze, Thomas Stehle, Hans-Christian Möhring

*Institute for Machine Tools – University of Stuttgart, Holzgartenstr. 17, 70174 Stuttgart, Germany*

\* Corresponding author. Tel.: +49 711 685-84558; E-mail address: [kim.werkle@ifw.uni-stuttgart.de](mailto:kim.werkle@ifw.uni-stuttgart.de)

---

### Abstract

To this day, undesired vibrations are a common problem in metal-cutting machine tools. Due to the development of lightweight structures and ever more rigid as well as low-friction machine elements, machine tools have increasingly fewer damping properties so that they are more susceptible to vibrations. The use of special particles and suspensions such as magnetorheological fluid leads to good damping properties. By integrating specially designed, additively manufactured structures in combination with such particles, it is possible to change the dynamic properties of a mechanical system. This paper presents the results of our study into the application of additively manufactured structures in combination with different particles, based on the example of a spindle-tool system. It showed that the structures and particles reduce the dynamic response and shift the natural frequencies.

© 2021 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Peer-review under responsibility of the scientific committee of the 54<sup>th</sup> CIRP Conference on Manufacturing System

*Keywords:* Additive manufacturing; Damping; Design

---