Assessing the Performance of a Magnetostrictive-Actuated Tool Holder to Achieve Axial Modulations with Application to Dry Deep Hole Drilling

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\section*{Abstract}

For machining operations such as drilling and tapping, the challenge of achieving dry machining is difficult due to the significant role that cutting fluid plays in lubrication and chip removal. A new approach for dry deep hole drilling of aluminum is presented. This new method utilizes a magnetostrictively actuated tool holder to modulate the axial position of a drill tip and thus vary the chip size. Under appropriate modulation conditions, small chips are produced that are relatively easy to evacuate through the drill flutes. The development of the magnetostrictive tool holder system is described and its performance is evaluated. The results of drilling tests performed with the magnetostrictive tool holder system are reported, and the new tool holder is demonstrated to offer promise as an alternative to drilling with a cutting fluid.

\textbf{Keywords:} Dry Drilling; Magnetostrictive Actuation