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A novel deep groove machining method utilizing variable-pitch end mill with feed-directional thin support

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Highlights

- A new method is proposed for deep groove machining which utilizes long-shank variable-pitch end mill with feed-directional thin support.
- The support device and the long-shank variable-pitch end mill were developed and applied to machining of hardened die steel.
- The proposed method was verified both analytically and experimentally.
- It was clarified that the proposed method significantly increases the chatter stability and realizes the high productivity in the long-shank or deep-groove end milling.

Abstract

A novel method for deep groove machining is developed which utilizes a long-shank variable-pitch end mill with a feed-directional thin support in this research. Recently, thin and tall ribs are required for many parts to reduce their weight and material consumption without sacrificing their stiffness and strength. It leads to necessity of deep and narrow grooves in dies and molds for their mass production. However, such deep groove machining is difficult, since long flexible end mills cause severe chatter vibrations induced by regeneration and mode-coupling. There have been many studies on the regenerative chatter vibration, while there have been few studies on

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