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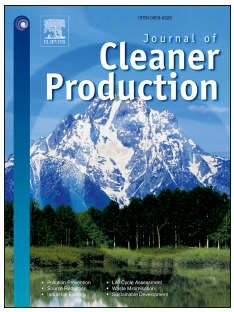

Recent advances in turning with textured cutting tools: A review

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Recent advances in turning with textured cutting tools: A review

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Abstract:

The environmental obligations on manufacturing industry have resulted in development of new methodologies regarding use of lubricants during machining. There has been a continuous effort to shift from flooded lubrication to minimum quantity lubrication. At the same time, the benefits in tribological properties of textured surfaces have also been noticed. An immense work regarding textured surfaces has resulted in an improvement in service lives of components by altering their surface topography. Recently, surface texturing has also been used in cutting tools. The surface textured tool in form of micro dimples or linear grooves either on rake or flank face has been found to decrease cutting forces, coefficient of friction and cutting temperature. The use of solid lubricant filled into textured groove is found to provide lubrication on tool rake face. Thus, an improvement in machining output parameters have resulted in an increase of tool life. The paper presents a thorough literature survey regarding use of textured cutting tools in turning. The main purpose of this review article is to provide a detailed information of the recently introduced sustainable technique in manufacturing of using textured cutting inserts and to encourage the same in metal cutting by discussing a way forward in this direction.

Keywords: Textured; micro dimples; linear grooves; rake face; tool life.

Nomenclature

Ψ_r	Approach angle
θ_0	Ambient temperature
k_{chip}	Average shear flow stress on tool-chip interface
θ_s	Average shear plane temperature
τ_c	Average shear strength at tool-chip interface
θ_t	Average temperature of cutting tip
F_x	Axial thrust force
ρ	Chip density
Ψ_λ	Chip flow angle
c_1	Chip specific heat
V	Cutting velocity