The impact of surface roughness of replaceable cutting inserts treated with MRF technology on the turning process

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This work investigates the effect of the surface roughness of uncoated replaceable cutting inserts (RCIs) on the turning process. The surface of the RCIs was modified using sandblasting and magnetorheological finishing (MRF) technology, and the results were compared with the original untreated surface. The experimental research was conducted on DMG Mori's NTX 1000 turn-mill center, where cutting forces were measured using a Kistler 9129AA dynamometer and analyzed using Dynoware software. The results showed that the roughness of RCI significantly affected the final workpiece quality, cutting forces and chip compression coefficient. The MRF-treated RCI showed lower cutting forces and better workpiece surface quality. In addition, MRF technology allows for more precise control of surface roughness and quality. Therefore, optimizing RCI roughness is critical for efficient and energy-saving turning operations.

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