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MATERIALS TESTING FOR PRODUCTION TECHNOL

Performance of coated and uncoated carbide/cermet cutti tools during turning

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Article Information

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Historically, cutting force and surface roughness are known to tant performance indicators in conventional machining operati are mainly affected by material type and the choice of cutting t well-known method to improve cutting tool performance is cov these tools with durable ceramic coatings to protect them from thermal degradation. This work elucidates the advantage of Al_2 TiN coatings and presents important performance improvemen turning operation. Process parameters such as cutting speed, f cutting depth and tip radius were taken into consideration in a 540 experiments. The design of the experiment and a statistica sis were performed to reveal significant process parameters. A experimental setup was designed to measure in-situ cutting fo surface roughness of the machined surfaces was measured. An neural network model was developed to predict optimum perfo parameters.

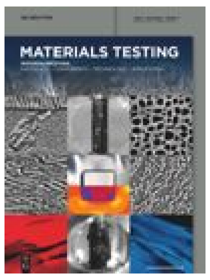
In conventional machining operations cutting forces and surface roughness are known to be important performance indicators. These are mainly affected by material type and the choice of a cutting tool. Various important machining parameters also affect machining quality, factors such as surface

and surface roughness were investigated by Kumar et. al. [4]. Roughness, residual stress, and the white layers as parts of surface integrity were classified as functions of the machining parameters and of the integrity of the cutting edge, i. e. of tool wear. Determination of the best suitable cutting conditions and

this work indicate that when 4340 steel using low feed rates cut, the forces were higher for m softer steel and that the surface the machined part was improv speed was elevated and deter feed rate [6]. Neural network roughness and dimensional accuracy. Several open-literature works emphasize this overlooked area. However many important machining parameter effects have not been adequately quantified. Work by Chen et al. studied optimal grey-fuzzy controller design for a constant turning force system. They explored the control of the turning process at a constant cutting force under various cutting conditions utilising the Taguchi experiment design approach [1]. Another research work concerns the influence of feed rate, cutting speed, and tool wear on the defects induced by turning on case-hardened 27MnCr5 gear conebrakes with an emphasis on its technical limitations in mass production [2]. This work also offers a mathematical model predicting the forces opposing the processing parameters [3]. The performance of ceramic cutting tools against tool wear, cutting force

cutting parameters during machining of AISI 304 stainless steel was studied by taking the process sound into consideration [5]. The ideal cutting parameters and the cutting process sounds obtained are compared and the best cutting parameters depending on the process sound are given. The machinability of hardened AISI 4340 high strength low alloy steel and AISI D2 cold work tool steel was studied by Lima et. al. [6]. The tests involving the AISI 4340 steel were performed using two hardness values: 42 and 48 HRC; in the former, a coated carbide insert was used as a cutting tool, whereas in the latter a polycrystalline cubic boron nitride insert was employed. The machining tests on the AISI D2 steel hardened to 58 HRC were conducted using a mixed alumina-cutting tool. Machining forces, surface roughness, tool life and wear mechanisms were assessed. Results in

predict surface roughness an
wear over the machining time fc
cutting conditions in finish ha
also carried out with regressio
veloped to capture process spe
ters [7]. The wear mechanism
tools made of tungsten-carbide
crystalline cubic boron nitride
polycrystalline diamond (PCD)
vestigated in another study usin
and temperature results availal
erature [8]. For the tool/work
WC/steel and PCBN/hardened
practical conditions, tool wear
be greatly influenced by temp
authors conclude that the most
nant tool wear mechanism for
sion and for PCBN chemical we
more experimental results and l
research is required to determi



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