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Optimization of ecological and economical cutting of magnesium-based hybrid vehicle materials

Ph.D. thesis

T1: I determined the optimal tool material and optimal edge geometry for simultaneous face milling of AZ91D+AlSi12 and AZ91D+SD11 in given technological data range: v_c=130-527 m/min, a_p=1 mm depth of cut, f_z=0,05...0,2 mm/tooth. Optimization method was proportion based ranking according to cutting force, specific cutting force, surface roughness and cutting temperature of sintered steel. [S1, S3, S4, S5, S7, S9]

T2: I determined the change of specific cutting force as a function of rake angles (γ_p and γ_f) during face milling with the optimal tool materials of the hybrid constituents (AZ91D, AlSi12, SD11).

T3: Using the line scanning mode of AGEMA THV® LWB-880 thermovision system I elaborated a method for measuring the chip temperature linked to the kinematical geometry of the rotating tool. Applying this method I determined those tool materials and edge geometry variations which ensure less than 250°C cutting temperature during milling of sintered steel containing Mg-hybrid material. [S2, S5, S8]

T4: Perpendicular micro scratching with given normal forces (5 N and 10 N) of the boundary of overlapped hybrid pairs demonstrated that the deformation difference on the two sides of the boundary can not be connected by empiric generalized relationship with the difference of hardness or elastic module difference of the hybrid pairs. [S6]