Experimental Investigation and Analysis of Cutting Forces When Machining X5CrNi18-10 Stainless Steel

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In this study, cutting forces experimental measurement an analysis with special carbide insert when turning austenitic stainless steel have been investigated. Stainless steel X5CrNi18-10 is often considered as poorly machinable material. In this experimental study a number of turning tests carried out by using a test lathe and a cutting force measuring device are presented. Accordingly the effect of cutting speed and tool insert cutting geometry on cutting forces in turning austenitic stainless steel X5CrNi18-10 (AISI 304) using Wiper cemented carbide tool insert has been discussed. The effect of cutting parameters (feed rate, depth of cut) is also analyzed by cutting forces measurement. The input parameters were varied as v_c = 100 m.min^{-1}, f = 0,150 and 0,275 mm and edge geometry κ_r = 95°, κ_r' = 5°, ε_r = 80°, r_ε = 0, 8 mm, λ_s = -6°. The results show that main cutting force F_c decreases with the increasing of cutting speed in turning without using the coolant. A benefit for production process also confirmed fact that this growth is 2,5 to 3 times higher as for turning of CS0E4 under the same machining conditions due to the hardening of austenitic steels for chip creation. It was also noted that experimental specimens showing larger cutting forces then generated worse surface finish as well as larger surface damage.

Keywords: Austenitic stainless steel, Cutting forces, Cutting parameters, KISTLER measuring device

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