

2nd International Conference and Exhibition on Mechanical & Aerospace Engineering

September 08-10, 2014 Hilton Philadelphia Airport, USA

A comparative study on machining parameters effects according to Taguchi design method by turning nickel based super alloys Inconel 600 and Hastelloy X

Abdullah Altin¹ and Muammer Nalnbant²

¹Yuzuncu Yil University, Turkey

²Gazi University, Turkey

Nickel-based alloys constitute an important class of materials, which are used under demanding conditions of high corrosion resistance and high temperature strength. These characteristics together with their good ductility and easy of cold working make them generally very attractive for a wide variety of applications; nearly all of which exploit their corrosion resistance in atmospheric, salt water and various acid and alkaline media. Hastelloy X and Inconel 600 is a nickel-chromium-iron-molybdenum alloy which is developed for high temperature applications and it is derived from the strengthening particles, Ni₂ (Mo, Cr), which is formed after the two-step age-hardening heat treatment process. With face-centered cubic (FCC), Ni-Cr-Mo-W alloys, named as Hastelloy, are used for marine engineering, chemical and hydrocarbon processing equipment, valves, pumps, sensors and heat exchangers. In this talk, the effects of cutting tool coating material and cutting speed on cutting forces and surface roughness were investigated on Taguchi experimental design. Main cutting force, F_z is considered to be cutting force as a criterion. The effects of machining parameters were investigated using Taguchi L18 orthogonal array. Optimal cutting conditions were determined using the signal-to-noise (S/N) ratio which is calculated for average surface roughness and cutting force according to the "the smaller is better" approach. Using results of analysis of variance (ANOVA) and signal-to-noise (S/N) ratio, effects of parameters on both average surface roughness and cutting forces were statistically investigated. It has seen that while cutting tool (37.35 %) and feed rate (34.02%) has higher effect on cutting force in Inconel 600, the feed rate (65.99%) and cutting speed (11.14) has higher effect on cutting force in Hastelloy X. While feed rate (56.13%) and cutting speed (19.00%) has higher effect on average surface roughness in Inconel 600, cutting tool (40.38 %), and feedrate (33.15%) has higher effect on average surface roughness in Hastelloy X.

Biography

Abdullah Altin is an Assistant Professor in Van Vocational of Higher School Mechanical and Metal Technology Department, from Van Yuzuncu Yil University in Turkey. His field of study is manufacturing and construction and has been working on CAD/CAM (computer aid design/computer aid manufacture), solid edge, master cam and production technics. He has been in Mechanical Engineering Department, Germany Zittau- Gorlitz University, for research and access to training in CAD/CAM by Erasmus Project. And he has also been invited for teaching Staff Mobility By Erasmus Program, Mechanical Engineering Department, Nancy University of Lorraine, in May 2013 to France. Since 1996 he has been working in Yuzuncu Yil University as a Lecturer and then as an Assistant Professor.

aaltin@yyu.edu.tr