ANALYSIS AND PREDICTION OF SURFACE ROUGHNESS IN FULLY INTERRUPTED HARD TURNING SKD11 STEEL USING HIGH CBN INSERTS

MINH TUAN NGO¹ & VI HOANG²

¹Lecturer of Faculty of Mechanical Engineering, Thai Nguyen University of Technology, Thai Nguyen City, Vietnam
²Associate Professor and Dean of Faculty of Mechanical Engineering, Thai Nguyen University of Technology, Thai Nguyen City, Vietnam

ABSTRACT
SKD11 cold instrument steel is a high-carbon as well as high-chromium blend instrument steel which is utilized for creating cold or hot operation dressing dies, sides of rollers, screw lines, lines dies, transformer core stamping dies, rolled knives, steel tube forming rollers, special shaping rollers, screw heading molds etc. The hardened SKD11 steel has a high hardness of 58-62 HRC, along with excellent wear resistance and exceptional toughness. Hard turning process is widely applied for machining the continuous and discontinuous surface of the parts made by the hardened SKD11 steel.

Interrupted hard turning was a complex machining procedure with high carving forces, temperature and vibration. The surface roughness is an essential parameter for determining the accuracy and quality of parts in the interrupted firm turning. In the study, examination and predicted model of surface firmness of SKD11 steel in interrupted firm turning using mixed ceramic inserts were performed based on different process variables, namely, slitting speed, feed and depth of slit. The results showed the feed rate was the most important variable influencing the surface roughness in the machining process. Estimation of surface roughness is challenging with regard to the concurrent influence of slitting variables. Hence, a mathematical design was generated and relied upon the concurrent influence of depth, slitting speed as well as feed rate. Maximization of the slitting variables was identified by The Face Central Composition Design-Response Surface Methodology (RSM-FCCD). Particularly, surface roughness reached its minimum value of 0.308 µm when the slitting speed was 120 m/min, feed rate 0.1 mm/rev and the depth of cut 0.15 mm. This minimum surface roughness was in good agreement to the measured Ra in the verified experiment.

KEYWORDS: Interruption, Discontinuous, Hard turning, Surface roughness & RSM-FCCD

Received: Jun 10, 2020; Accepted: Jun 30, 2020; Published: Jul 29, 2020; PaperId.: IJMPERDJUN2020517