

Performance of nitrogen gas as a coolant in machining of titanium

Abstract:

Machining of titanium and its alloys is still the subject of research and researchers' interest despite some improvement in its machinability from several machining methods. This research presents performance of nitrogen gas in machining titanium. Machining of titanium is carried out on conventional turning center with triangular insert and holder according to ISO designation. Compressed nitrogen gas contained a cylindrical tank is supplied to the cutting zone via specially-designed valve that controls pressure and volume of nitrogen. The gas outlet pipe of diameter 2 mm is directed to just-above the tool rake face. During machining, the gas is supplied with high pressure so that the cutting zone receives an effective cooling as well as the chip will easily break. The effectiveness of this new cooling strategy is demonstrated by tool condition after machining, and also by comparing with performance of conventional coolant. The result is found to be excellent in terms of relative amount of tool wear. The cutting insert has surprisingly been almost intact when using nitrogen gas as coolant whereas tool wear at failure state has occurred with conventional coolant for the same machining parameters.