Analysis of the Parallelism Deviation in the Horizontal Dry Turning of UNS A97050 Al-Zn Alloys

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Abstract

Aluminium alloys are widely employed in airships building industry because of their excellent ratio weight-density/mechanical properties. Thus, most of principal airship structural parts are formed by aluminium alloys. These alloys need to be mechanically worked by different machining processes due to necessities of manufacture and assembly. Each element of an airship requires a high level of surface quality, and among them, the machined aluminium alloys pieces. Thus, dimensional and geometrical design specifications must be rigorously followed. On the other hand, environmental laws have driven the production systems toward the application of cleaner technologies. So, in machining, the employment of both hazardous, toxic and high environmental impact cutting fluids (lubricants and/or coolant) must be minimised. In this way, cutting using minimum quantity of lubricant (MQL) or, better, dry machining have been promoted as environmentally friendly alternatives to classical machining processes which use those cutting fluids. In this work, parallelism deviation (PD) of dry turned UNS A97050 (Al-Zn) cylindrical bars have been studied in a wide range of cutting speeds (v) and feeds (f). The results obtained have allowed establishing a parametric model for predicting the parallelism deviation as a function of those cutting parameters. From this model, a prediction surface PD(f,v) has been constructed. This surface allows determining marginal PD(f) and PD(v) curves for specific v and f values, respectively.