

Preface

A growing concern in the aerospace, automotive and biomedical industrial segments of the manufacturing industry is to build absolute reliability with maximum safety and predictability of the performance of all machined components. This requires development and deployment of predictive models for detailing the effects of varying machining parameters on fatigue life of machined components. The fatigue life is mainly affected by the residual stresses developed during the machining. Residual stresses are produced due to plastic deformation material while machining. The plastic deformation generates cracks and micro structural changes, as well as large micro hardness variations. Residual stresses have consequences on the mechanical behaviour, especially on the fatigue life of the workpieces. Residual stresses are also responsible for the machining distortion phenomenon of the machined parts which lead to difficulties during assembly. The literature detailing the effects of varying operating parameters on tool life when machining Titanium alloy is comprehensive, however, relatively little of this data refers to their effects on machined workpiece surface integrity particularly, residual stress generation and distortion created. Greater knowledge of the effects of operating parameters on surface integrity is critical to the acceptance of new environment, cutting path and cutting sequence strategies on machining of Ti6Al4V aerospace alloys to increase the functional requirements and fatigue life of the milled thin components. In this book four chapters have been included to address the above reported issues.

The use of polymer matrix composite materials has significantly increased in the last few years. The aerospace, naval and automotive are the industry's highly interested in this material, because of its strength/weight ratio which made it very attractive. Edge trimming, cut-outs and holes exist in most of the composite structures. For example in an aircraft fuselage structure, around 10 million holes are required for joining purposes. However due to their laminated constructions several types of damages like matrix cratering and thermal alterations, fibre pullout and fuzzing, are introduced during machining. Trimming the edges of the composite part is the first and mandatory machining operation carried out after the composite parts are demoulded. This operation is done using conventional machining widely, or in some cases by using abrasive water jet cutting. The heterogeneity and anisotropy of the composite materials made their machining difficult. This has lead to the propagation of many defects. Damages are located at the free edges of the laminate or through the thickness (fibres pull-out and resin degradation). Few chapters have been dedicated to address the issues of edge trimming and drilling of composite materials.

Particularly, the influence of the quality of the machined surfaces (drilling and trimming) on the mechanical behaviour is analysed for different processes of machining. A chapter has been dedicated to address the challenges in drilling of multimaterials. This book will be a useful guide to those who would like to understand the issues in machining of titanium alloys and polymer composite materials. The editors express their sincere thanks to the authors, who contributed papers for this book.

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