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T. Klotz, D. Delbergue, P. Bocher, M. Lévesque, M. Brochu

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T. Klotz[a,*], D. Delbergue[a,b], P. Bocher[b], M. Lévesque[a], M. Brochu[a]

[a]*Département de génie mécanique, École Polytechnique de Montréal, Qc H3T 1J4, Montréal, Canada*
[b]*Département de génie mécanique, École de Technologie Supérieure, Qc H3C 1K3, Montréal, Canada*

Abstract

Shot peening is commonly used in the aerospace industry to improve mechanical components fatigue life. It introduces compressive residual stresses and cold work at the surface which tend to close short fatigue cracks and delay their propagation, respectively. However, shot peening also creates surface irregularities that can be detrimental to fatigue. The effect of different shot peening conditions on Inconel 718 tested in low and high cycle fatigue is presented in this study. An analysis of the fatigue life, crack initiation mechanisms, residual stress relaxation, process induced strain hardening and surface roughness showed that, in high cycle fatigue, shot peening can increase Inconel 718 fatigue life from 2 to 20 times, depending on the shot peening conditions. This observation suggests that careful selection of peening parameters is crucial. In low cycle fatigue the roughness resulting from shot peening is to be considered while in high cycle fatigue, it is the presence of significant residual stresses.

Keywords: Inconel 718, fatigue, crack initiation, shot peening, residual stresses relaxation

1. Introduction

Inconel 718 is a nickel-based superalloy largely used in aerospace gas turbines components submitted to cyclic loads. Shot peening is a cold work process consisting in impinging hard particles at high velocity onto a ductile metallic surface. The process introduces compressive residual stresses and work hardening on the specimen's surface layer [1], which improves its resistance to fatigue. Compressive residual stresses tend

*I am corresponding author
Email addresses: thierry.klotz@polymtl.ca (T. Klotz), dorian.delbergue.1@ens.etsmtl.ca (D. Delbergue), philippe.bocher@etsmtl.ca (P. Bocher), martin.levesque@polymtl.ca (M. Lévesque), myriam.brochu@polymtl.ca (M. Brochu)