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Evaluation of the residual stresses induced by shot peening on some sintered steels

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Abstract

The effect of shot peening treatment on sintered steels plates were analyzed in terms of micro-structural and mechanical properties and residual stress profiles. Two high performances powder metallurgy steels were considered: the former was obtained starting from diffusion bonded powders, whereas the latter starting from pre-alloyed powders. Two different nominal densities were considered, 6.9g/cm³ and 7.1g/cm³. After a preliminary optimization, two shoot peening cycles were selected and carried out on the investigated materials. Residual stresses after the treatment were measured by means of the hole drilling technique and related to the mechanical properties and the surface densification of both steels, varying the nominal density.

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1. Introduction

Powder Metallurgy (PM) is a technology able to produce net-shaped parts with both good geometrical precision and mechanical properties. In the conventional process, the mechanical parts produced by PM are characterized by some residual porosity after sintering, which is known to affect the final mechanical properties. Fatigue resistance is significantly reduced by residual porosity, because fatigue cracks are favoured to nucleate in correspondence of clusters of pores and tend to propagate along the pores network [1, 2]. Nevertheless, in the applications PM parts are often submitted to fatigue loadings. A potentiality for enhancing fatigue strength is to increase the density of the part, so having only a few percent of residual porosity. But this cannot be achieved by the conventional processes, especially if the part has a

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