Abstracts

**FATIGUE RESISTANCE OF MARAGING STEEL AFTER LASER PEENING**

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Maraging steels are characterised by an exceptional combination of mechanical properties making them suitable for the manufacturing of parts used in critical and added value applications in aerospace engineering and the tooling industry. Depending on the service environment, maraging steel components may be exposed to dynamic mechanical stresses, corrosion or stress corrosion cracking, and thermal fatigue. In order for these components to withstand demanding working requirements, further improvements of their mechanical properties are necessary. Researchers have studied several surface engineering techniques on maraging steels, such as laser surface melting [1], physical vapour deposition [2], nitriding [3, 4], and shot peening [5]. Thus far, the effects of laser peening on maraging steels have been investigated only through surface layer analysis [6-8] without conducting fatigue tests which offer further insight into the extent of possible fatigue resistance improvement. The scope of the presented research was to investigate the influence of laser peening on the fatigue resistance of high-strength maraging steel. The laser process was conducted in confined mode without an absorbent coating using a Q-switched Nd:YAG laser with a constant laser pulse energy. The residual stress analysis (Figure 1(a)) showed a significant influence of the chosen laser parameters on the residual stress distribution in the thin surface layer. Consequently, this phenomenon proved to have a huge impact on the fatigue resistance (Figure 1(b)) of the analyzed maraging steel.

(a) (b)

Fig. 1. (a) Effect of the laser parameters on residual stresses in the surface layer at a depth of 0.05 mm. (b) Bending fatigue life before and after LSP using different combinations of laser pulse density (PD) and laser spot diameter (SD).