# Residual Stresses of 3D Printed Maraging Steel with and without WOKA Cold Spray

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**Abstract:**
Fatigue crack initiation and propagation play an important role in fatigue properties, where they are shown to be strongly associated with surface roughness, microstructure parameters (dislocation density, crystallite size, microcracks) and last but not least macroscopic residual stresses. During additive manufacturing using the selective laser melting technology, a complex residual stress distribution is created that can significantly affect the printing itself and also the mechanical properties of the final product. The magnitude of these stresses may even approach the yield strength of the material. Thus, firstly, research has been carried out to optimize 3D printing parameters to minimize residual stresses in maraging steel. It was found that the preheating temperature of the build platform significantly affects both the residual stresses and microstructure parameters as well as the mechanical properties. In a second step, a cold sprayed WOKA (chromium-tungsten-based carbide alloy) was applied to the surface of the 3D printed part to increase durability in harsh environments with predictable response to dynamic, cyclic and vibration service loads. By analysing the residual stresses using X-ray diffraction, it was confirmed that after optimizing the spraying parameters, the compressive residual stresses prevail in the subsurface layers of the sprayed layer, which was the objective of the research.