

139 Influence of physical constraint combined with uphill quenching on residual stresses in 7000 series aluminium alloys

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Abstract. The aim of this study is to quantify the magnitude of residual stresses that can be relieved during a variation of uphill quenching heat treatment. The alloys being tested are 7000 series aluminium alloys. Residual stresses are formed as a by-product of solution heat treatment of alloys. Residual stresses can have adverse effects on the mechanical properties and can cause distortions of parts post solution heat treatment. Uphill quenching is a thermal heat treatment method that occurs post solution heat treatment. Cooling a test piece to -197 °C in liquid nitrogen and then rapidly reheating in boiling water or high pressure steam. This study will add a variation to the standard uphill quench. The test piece will be thermally constrained along the long axis during the reheating phase of uphill quenching. The test piece is simple rectilinear shaped part to try insure uniform stress redistribution. The residual stresses are determined by x-ray diffraction using the $\sin^2\Psi$ method and neutron diffraction. Results are compared to finite element simulations using Abaqus and available literary data.