Integration of numericaly computed residual stresses into fatigue life model for lifetime optimisation of machined parts

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Abstract

This communication concerns the optimization of the fatigue life of machined surfaces. Since 2005, the LTDS laboratory has developed a scientific simulation method to predict the state of residual stresses generated by cutting operations on the surface of parts. This simulation method is based on determining and applying thermomechanical loadings representative of the cutting process, calibrated using experimental data. This method has reached an industrial maturity level both technologically and scientifically. It is now available as a commercial software, MISULAB, which predicts the three-dimensional residual stress fields resulting from a finishing machining operation. The goal of this communication is to demonstrate how these numerical three-dimensional residual stress fields can be used in fatigue strength calculations. It also shows how MISULAB can be connected to the NCode DesignLife software to more accurately estimate the fatigue life of a rotating shaft by optimizing machining conditions and/or tool geometries.

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