Application of the Sehitoglu's Model for the Calculation of Tool Life in Thixoforging of Steel Parts

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Abstract. Thixoforming as a forming technology takes advantage of the semi-solid material state in order to produce geometrically complex parts. In the automotive industry, several aluminium components are partly manufactured by thixoforming processes. However, the production of steel parts is still challenging and has not been established in industry, yet. One of the main reasons is short tool life due to high process temperatures. In this paper, the Sehitoglu's model is introduced as a life prediction approach for forging tools. For this purpose, results of low-cycle fatigue as well as thermo-mechanical fatigue tests are presented. The findings are used for the determination of the model's material parameters. Numerical calculation of the thermo-mechanical tool loads during thixoforging was carried out. Fatigue tool life can be calculated on the basis of these data by implementing the Sehitoglu's model in the commercial FE software Simufact.forming by means of user-defined subroutines.