

## **Design and optimization of a closed die forging of nickel-based superalloy turbine blade**

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### **Abstract:**

The nickel-based superalloys belong to widely used materials for most demanding industrial applications. The design and the experimental verification of manufacturing technology of NIMONIC 80A turbine blade is presented in this paper. A finite element (FEM) simulation was exploited for the closed die forging technology optimization. Based on the precision material model and boundary conditions, the deformation behaviour in the range of hot working temperatures was studied. The process conditions including the strain rates were preset according to the industrial scale practise. Based on the FEM simulation results the necessary tools were manufactured and the experimental closed die forging of turbine blades was performed. Subsequently, a heat treatment of forged blades was carried out. The minimum of 1300 MPa tensile strength was achieved. A metallographic survey was carried out to verify the structure homogeneity.

### **Key words:**

NIMONIC 80A, turbine blade, FEM simulation, closed die forging