Numerical Simulation of Multi-directional Hot Forging for the Reduction of Forging Defects

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ABSTRACT

Hot forging is a metal forming process widely used in the industry. Among the many advantages are the possibility of severe plastic deformations and the improvement of mechanical properties, leading to the continued development of forging for industrial applications.

The conventional hot forging of complex geometry components is performed in several steps, what is favorable to initiate, or propagate defects formed in the early steps due to the deformation process. In order to obtain products in a single processing step, this research aimed the development of an innovative multi-directional forging process in a press with five hydraulic actuators.

The finite element method was used to simulate the manufacturing of a 38MnSiVS5 steel connecting rod to preview the distributions of temperature, equivalent strain and von Mises stress in the forged product, as well as the formation of internal defects.

The upper and lower dies were designed with three different geometric models to achieve the best material flow behavior, which avoids fold and other defects, and leads to the complete flashless filling of the die.

The simulation results showed that dies smoothly tapered at the small and big ends of the rod allow the material to flow easily to areas of difficult access, for instance, at the corners of the forging diesFor any further request, please contact the Secretariat: