6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 – 15 June 2018, Glasgow, UK

A 3D COUPLED THERMO-MECHANICAL PSEUDO INVERSE APPROACH FOR METAL FORMING SIMULATION AND PREFORM DESIGN

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Key Words: *Metal Forming, Pseudo Inverse Approach, Optimization, Thermo-mechanics.*

Bulk metal forming is a widely used industrial process due to the mechanical advantages exhibited by forged parts. It is also a prime candidate for inverse analysis, since in most cases the final desired part shape is known whereas the initial and intermediate shapes in a multi-step process are unknown. The inverse simulation of the process is complicated due to the nonlinear material properties and process characteristics. Preform and intermediate shape design studies based on a direct simulation approach are of limited practical use due to the significant computational effort involved.

The Pseudo Inverse Approach attempts to solve the issues in conventional direct simulation and inverse simulation studies with the help of a hybrid inverse and large-step direct simulation strategy that keeps the advantages of the inverse simulation while also being able to account for non-linear material and process characteristics. This leads to a significant reduction in computational effort and makes it more suitable for optimization studies. The Pseudo Inverse Approach developed in the case of axisymmetric case is extended here to the full 3D thermos-mechanical case and the results are compared with available commercial software.

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