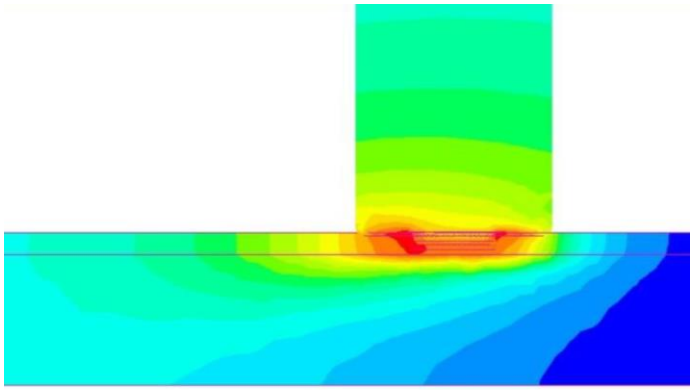
Bachelor-, Projekt-,
Staats- und Masterarbeiten

ISF WELDING AND JOINING INSTITUTE | RWTH AACHEN UNIVERSITY

Thema: Thermo-Mechanical Analysis of Friction Stir Welding of Dissimilar Materials



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Art der Arbeit:

Bachelorarbeit		experimentell	
Projektarbeit		konstruktiv	
Staatsarbeit		theoretisch	X
Masterarbeit	X	Literaturarbeit	

Start: asap

Fachbereich:
Rührreibschweißen - Friction Stir Welding

Description:

Friction stir welding (FSW), a solid state welding technique that has proven to be an effective solution in joining hard to weld materials with low energy inputs and greater repeatability. It is a complex process involving excessive plastic deformation and temperature. A cylindrical tool comprising of a shoulder and a profiled pin is rotated and slowly plunged into the workpieces butted or lapped together. This non-consumable rotating tool not only generates enough frictional heat needed to plasticize the workpieces but also causes a stirring effect that leads to material flow along the path the tool traverses. In this method joints are obtained at temperatures well below the melting point of materials and thus inherently prevent the formation of new phases.
The rotational speed and force exerted by the tool shoulder and pin strongly influence the deformation behavior, heat and material flow and as a consequence the final microstructure of the weld joint. Experimentally determining the optimal parameters is both time consuming and expensive. In such situations developing a 3D FE model is an efficient way of optimizing the process parameters and consequently the mechanical properties. In this study focus is laid upon the development of a 3D CEL model for welding Al and steel and identifying the optimal weld parameters like tool position, tilt, rotational speed and weld speed.

Tasks:

- Literature review on CEL modelling of FSW.
- 3D Modelling of the tools, workpieces and weld setup
- Parameter studies for optimal process parameters
- Analysis of results for defect free weld joints, temperature and tooling forces
- Documentation and presentation at the end

Miscellaneous:

Duration : 6 months
Language : English or German
Exp : Prior experience with Abaqus is preferred