

An Investigation of Temperature Dependent Parameters in Friction Stir Welding

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Objective:

The aim of my research is to accurately predict temperatures throughout the workpiece during the entire weld cycle. To accomplish this, one must understand and quantify the heat input as well as losses to the tool, backing plate, and surroundings (see Figure 1).

Background:

One major difficulty in modeling the temperature field is due to large changes in material properties. For example, many current models use a constant viscosity and/or friction coefficient to simplify computations. These properties are often chosen such that predicted results will match experimental data. This logic, however, is too simplistic since it may only be accurate for very specific conditions. Typical results of different backing plates and varying welding speeds are shown in Figures 2 and 3 respectively.

Future Work:

In reality, the way material properties change can greatly affect the temperature field and hence final weld properties. If a model is to be developed which can accurately predict temperatures for a variety of conditions then these changing properties must be quantified. One goal of my research will be to investigate these dynamic properties. In addition, I will investigate other important effects such as the initial dwell time, tool rotation and traverse speed, different tool geometries including threaded versus smooth pins, and varying contact resistance.

The results of my work will identify and provide a firm understanding of key parameters in predicting the temperature field. With this knowledge welds may be made more accurately and efficiently.

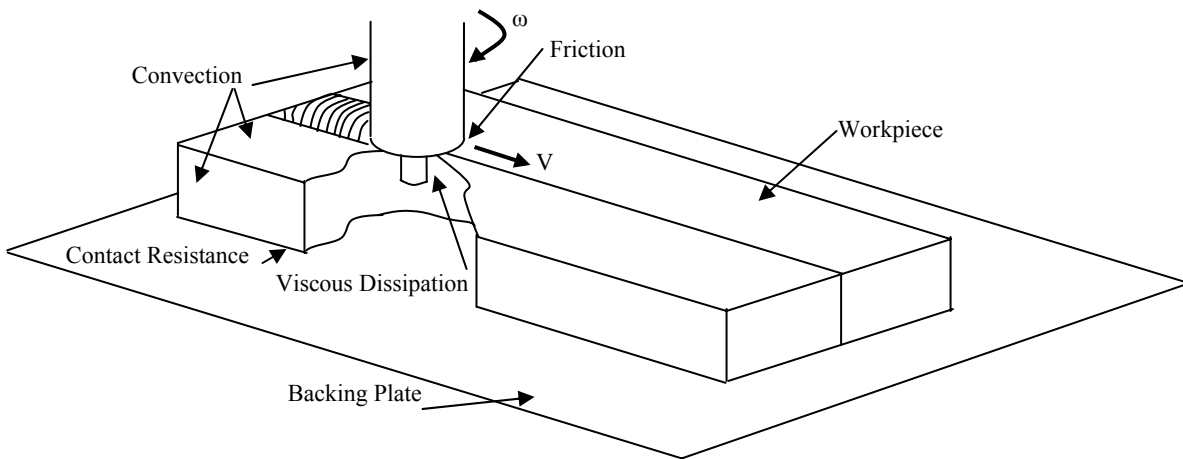


Figure 1: Friction stir welding diagram

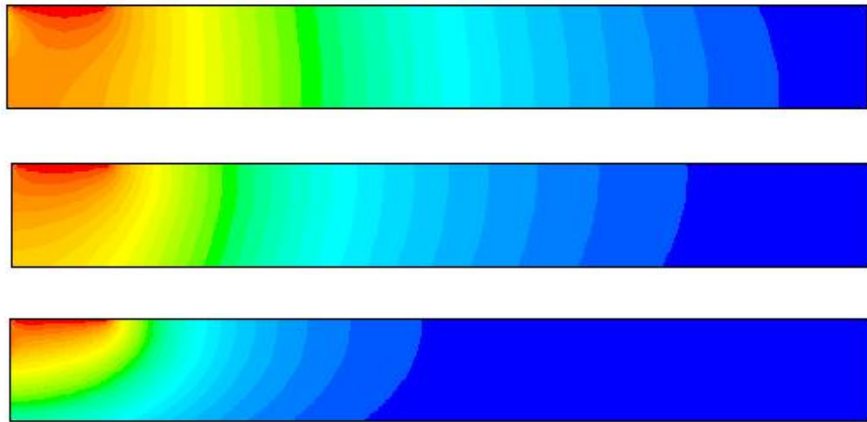


Figure 2: Thermal contours for various backing plates

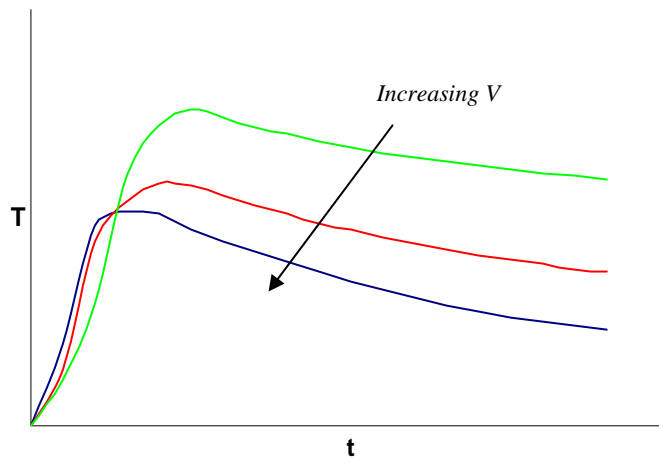


Figure 3: Effects of weia speea