Analysis of Effect of Interface Materila on Various Characteristics in Rotary Friction Welding of Stainless Steel 304 and Inconel 600 Simulated Using ANSYS Workbench

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ABSTRACT

Nickel based alloys have excellent resistance in extremely stressful environments, such as those found in pressure vessels, rocket engines, gas turbines, and other aircraft structures. Inconel 600 has good mechanical strength in the range from cryogenic temperatures to 1200°C. In some circumstances, it is to be welded with stainless steel structures. Together, Inconel 600 and SS 304 have poor weldability. In the present work, the enhancement of weldability of Inconel 600 and SS 304 has been attempted by inserting a third inter layer in between them. Rotary friction welding was used to weld Inconel 600 and SS 304 dissimilar materials. The feasibility of using inter layer between Inconel 600 and SS 304 has been carried out using finite element analysis to assess the penetration, sticking and sliding characteristics at the interfaces along with deformation properties. Taguchi's deign of experiments was employed to find the significant major parameters of rotary friction welding. The salient conclusion of the present work is that penetration, sticking and sliding characteristics are greatly affected by the frictional pressure.

The major SPIF process parameter which influences the formability of hemispherical cup was sheet thickness. The strains obtained through experimentation were within the limit of the formability curve.

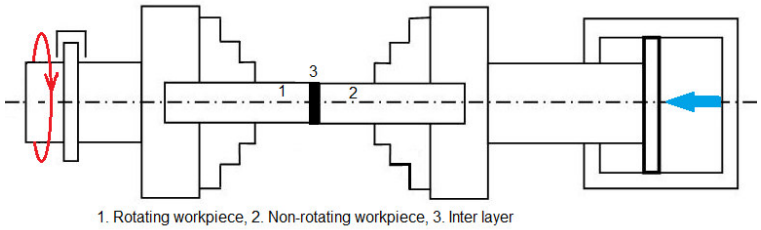

Figure 1: Rotary friction welding process with inter layer

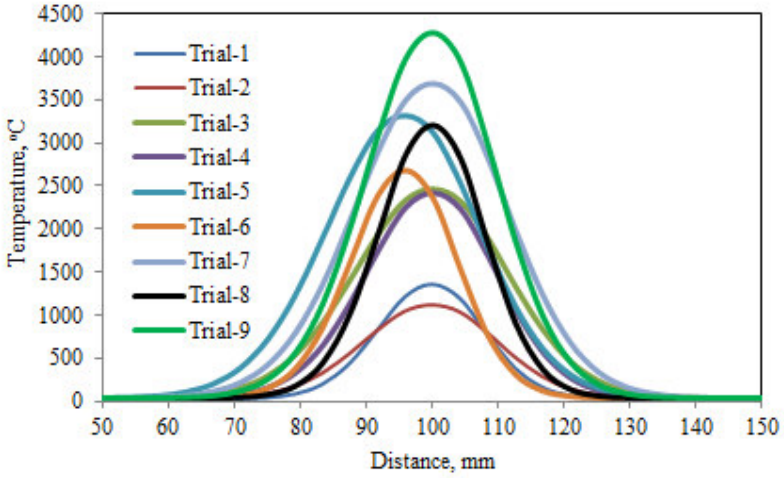

Figure 2: Fig. 4 Effect of frictional pressure on temperature distribution.

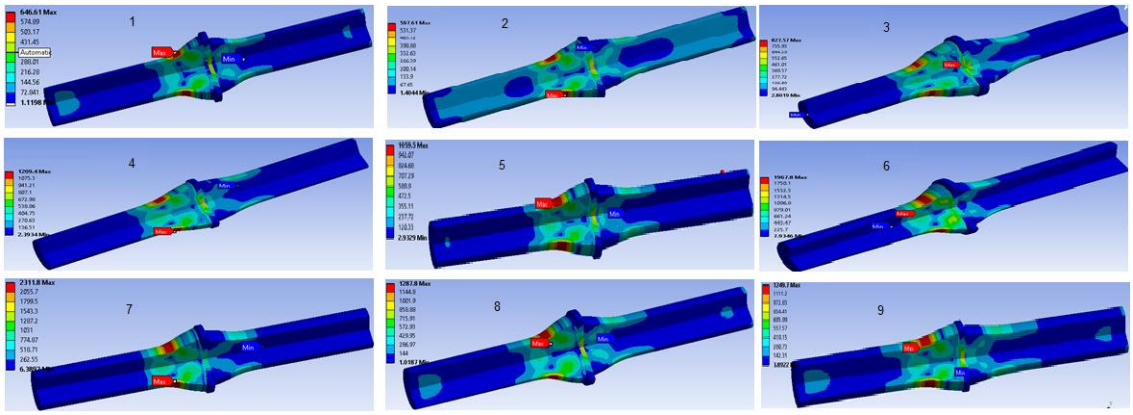

Figure 3: Equivalent stress values of different trials.

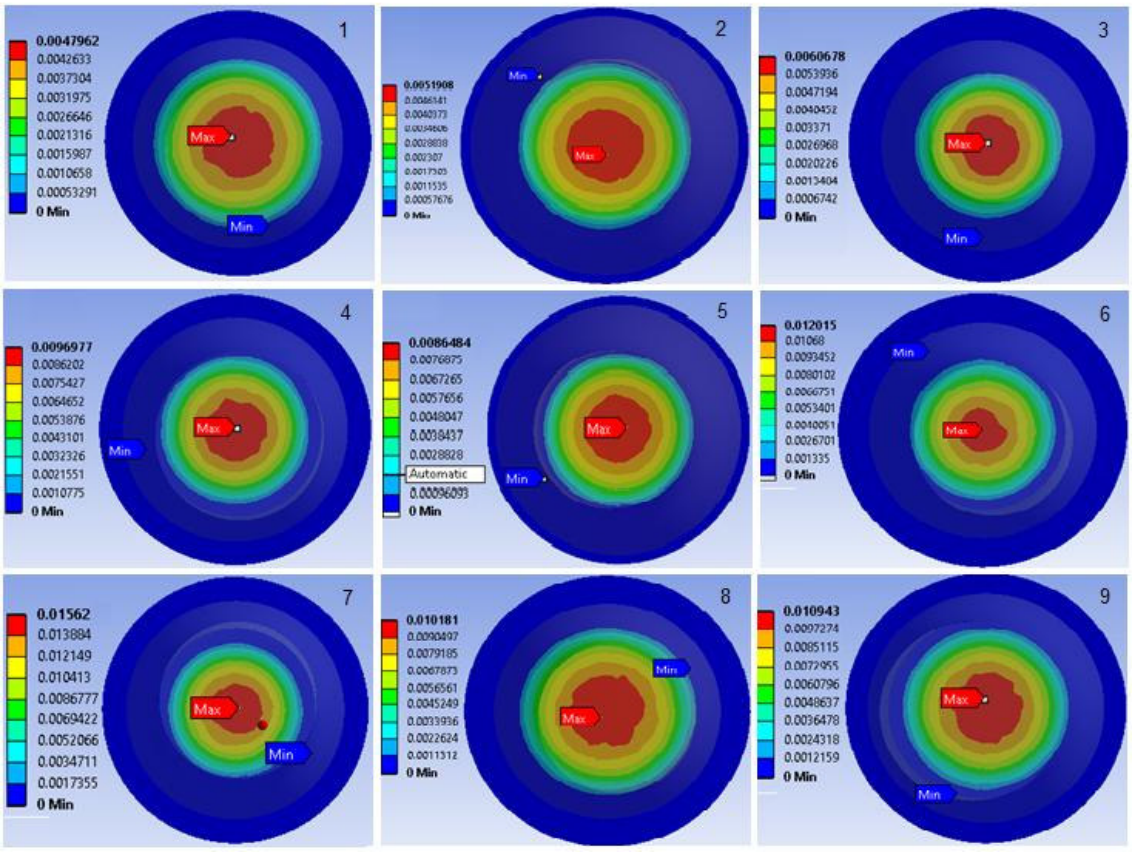

Figure 4: Influence of process parameters on penetration.

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