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# FINITE ELEMENT ANALYSIS ON DISSIMILAR THICKNESS JOINING OF THE TAILOR-WELDED BLANK PROCESS

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## Abstract

Tailor welded blanks are defined as a joining process for two or more pieces of flat material with dissimilar material types or thickness, and or mechanical properties. TWBs in automotive parts manufacturing will increase with the improvement in welding technology and development of newer light materials available (Das, 2000). Tailored blanks are usually produced by laser welding and it is not possible to use standard tests to determine mechanical properties of the weld zone in tailor-welded blanks (Rojek et al., 2012). As heat is main contribution factor, it is important to determine correct positioning of the heating in setting up the TWB process; it must be balanced and optimized. In this study, the finite element analysis has been adopted to determine optimum heating arrangement for joining the different aluminum thickness. The obtained finite element result is shown in Figure 1.

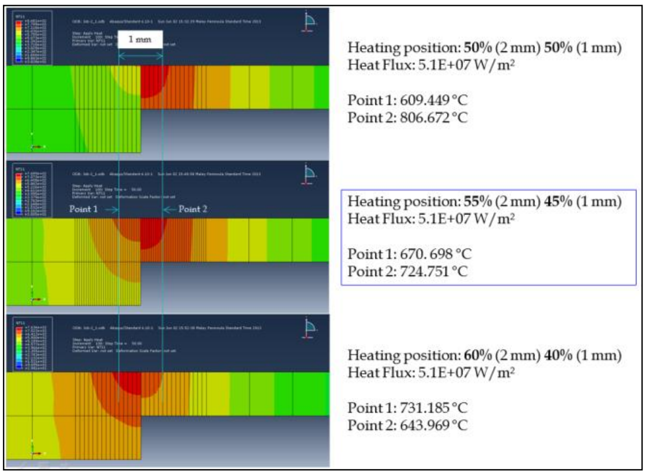
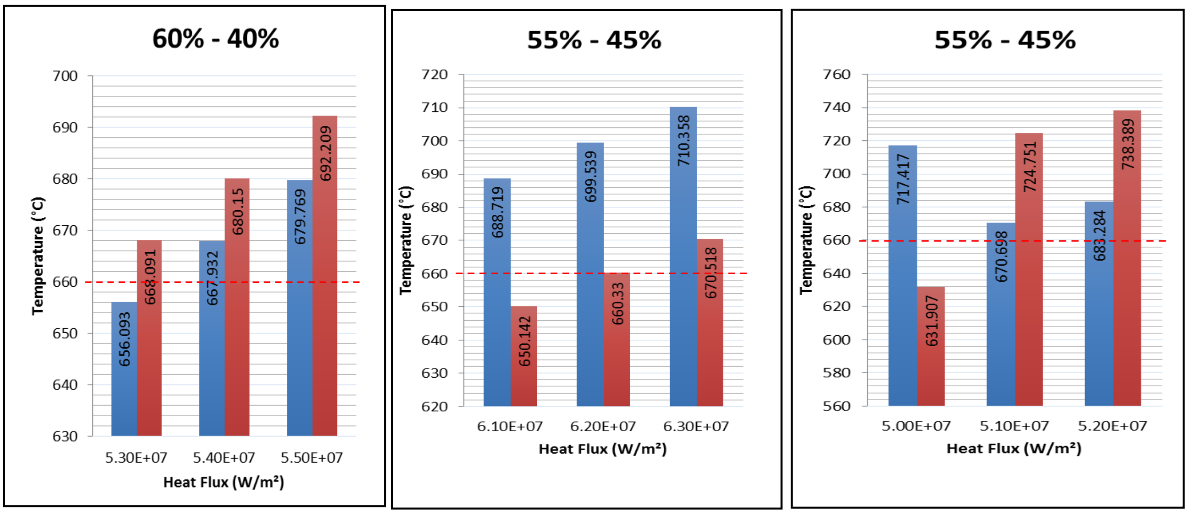



Figure 1: The finite element results

The studied conditions were modelled based on three combinations; i.e. joining between 3mm-1mm, 3mm-2mm and 2mm-1mm. The optimum heating positining based on finite element analyses are simplified as in Figure 2.




(a) (b) (c)

Figure 2: Graph temperature for different position of heating on thickness
(a) 3mm-1mm (b) 3 mm-2mm (c) 2mm-1mm

The results show that different combination of material thickness requires different heating zones to balance melting area of the TWB process. Increasing the thickness of the material is increases the use of heat flux. Combination of thickness 3 mm with 1 mm required 54 × $10^6$ W/m² of heat flux and its heating position is at 60 % on 3 mm thickness region and 40 % on 1 mm thickness region. For combination of thickness 3 mm with 2 mm are required 62 × $10^6$ W/m² of heat flux and its heating position is at 55 % on 3 mm thickness region and 45 % on 2 mm thickness region. Then, combination of thickness 3 mm with 1 mm are required 51 × $10^6$ W/m² of heat flux and its heating position is at 55 % on 2 mm thickness region and 45 % on 1 mm thickness region.

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